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W. H. BOARDMAN, *President and Editor.*
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CONTENTS

The committees of the American Railway Engineering and Maintenance of Way Association are especially to be commended this year on the excellence of their work. There will be nineteen reports submitted to the convention week after next, the majority of them being unusually voluminous, and all containing matter of much professional worth. These valuable reports should, and undoubtedly will, receive the careful study of the members of the association, and the resulting discussion in the convention will doubtless add considerably to the value of the material gathered by the committees. Indications point to an unusually successful convention for 1909, and it is to be hoped that every member road of the association will see that it not only is desirable but is its duty to have at least one representative present throughout the convention.

The question of abolishing smoking cars on suburban trains, electric and steam, is being agitated at Chicago. The city commissioner of health and the presidents of three of the four elevated railways have expressed themselves as in favor of the proposed change. The abolition of special accommodations for "smokers" on suburban trains on the steam lines that run to Flossmoor, Elgin, Waukegan and other points, the trips to which take an hour or more, does not seem needful or desirable. These trains ordinarily are not over-crowded, and their schedule time is so long that it would be a species of cruelty to deprive the male passengers of the comfort and pleasure of the morning and evening cigars with which, aided by the newspapers, they while the time away. But the argument for abolishing the smoking cars on the elevated electric trains, and on the steam trains that compete directly with them, is very strong. These trains usually reach their ultimate destinations in not more than 30 minutes, and anybody but a "cigarette fiend" should be able to get along that long without smoking. The trains always are over-crowded during the rush hours, and the air in the smoking cars, due both to their over-crowded condition and to the smoke that fills them, is of the vilest. Worse still, it seems impossible to prevent many of the habitual patrons of the smoking cars from spitting on the floors. In consequence of these conditions many men who smoke at their offices and homes avoid the smoking car when they can find any place else to sit or stand. When, owing to the packed state of other cars, women are forced to go into the smokers, they find them extremely disgusting. On the grounds both of public health and common decency, either the habits of many of those who smoke should be reformed, or smoking cars should be taken off all suburban trains except those running relatively long distances. And this applies to many cities besides Chicago.

SOME NEGLECTED FACTORS OF FAIR VALUATION.

A difference of opinion that is said to have arisen between Governor-elect Stubbs and the Railroad Commission of Kansas over the way the railways of that state ought to be valued for rate regulation shows that a more intelligent view of this subject is beginning to be taken by some public authorities. It is said that the commission does not think the state valuation would be very useful in fixing rates. Mr. Stubbs favors a valuation for rate regulation, but thinks that it should not be based solely on the physical properties, but that some allowance ought to be made to the older roads for the business they have built up. The absurdities to which a valuation based on physical properties alone leads have been illustrated in the testimony taken by the Interstate Commerce Commission in the proceeding of the Railroad Commission of Texas against the advance in interstate class rates to the Southwest. It was shown by the Chief Engineer of the Texas Commission that a much higher valuation per mile has been placed by this commission on the Trinity & Brazos Valley, a relatively new road, with comparatively small traffic and earnings, than on older roads with more traffic and larger earnings, such as the Galveston, Harrisburg & San Antonio, the Houston & Texas Central and the Missouri, Kansas & Texas. Of two roads, differing only in that one is new and the other old, the valuation of the older, based upon the cost of reproducing it in its present condition, is pretty sure to be less than the valuation of the newer, owing to the greater depreciation charged against the property of the older, although the older is almost sure to have more traffic and to be worth more as a "going" concern. All intelligent public officials must see in due time, as those of Kansas seem to see already, that there is something radically wrong with a method of valuation that leads to conclusions that contradict common sense.

Mr. Stubbs is on the right track when he says that valuation should take account of established business. The two factors that determine the actual "going" value of any concern are its physical plant and its earnings. It has been argued that the earnings of railways cannot be taken into account in

making valuations as a basis of rate regulation because present earnings depend on existing rates and the reasonableness of existing rates is the thing to be determined. But earnings do not depend entirely on rates. They depend also on the amount and nature of the traffic handled. A road with a dense traffic and low rates may have larger gross and net earnings than a road with less traffic per mile and higher rates. Therefore, while commissions may, perhaps, properly disregard earnings in making valuations, because earnings depend on rates, they ought to give weight to density of traffic, because nothing could be plainer than that, other things being equal, a road with a heavy traffic has more value per mile than one with a light traffic. The amount of traffic a road has always depends largely on the way it is managed, and a road that has built up a large traffic deserves the wages of good management.

Another factor that should enter into valuations is the cost of handling business. Of two roads having plants representing approximately the same investment, and hauling approximately the same kind and amount per mile of traffic, the one whose operating expenses are the lower will have the larger net earnings and should be given the higher valuation. Other things equal, low operating expenses, like heavy traffic, are due to good management, and not to take operating expenses into account in making valuation tends to deprive a road of the benefit of good management and to put a premium on bad management.

A heavy traffic, relatively low operating expenses and resultant large present and prospective net earnings, are all largely due to superiority of strategic location, which, in turn, is due to the good judgment that has been shown in choosing the routes of the main lines and in throwing out branches, and the genius that has been exercised in laying down a railway is as much entitled to its reward as the skill later shown in operating it.

Valuations based upon and giving due weight to not only the cost of reproducing the physical plants, in their present conditions, but also to strategic location, to density of traffic and to operating expenses, would not lead to such grotesque results as valuations based solely on cost of physical reproduction. One strong argument against physical valuation is the harm it would do to the weaker of any two parallel and competing lines if logically applied in regulating rates. Good examples may be found in every part of the country. As good as any, perhaps, is that afforded by the Union Pacific and the Denver & Rio Grande. Owing to the difficult country through which it runs, and the consequent high cost of construction, the physical valuation placed on the Denver & Rio Grande would no doubt be much higher in proportion to its traffic and earnings than that placed on the Union Pacific. But if the valuation led to a reduction of the rates of the Union Pacific the Denver & Rio Grande would have to reduce its rates on all of the business for which it competes with the Union Pacific, and its earnings would be curtailed, although on the basis of the physical valuation it should have been shown that it was already getting less than a reasonable return upon the investment it represents. On the other hand, if the strategic location, density of traffic and operating costs of the two roads were given due weight, the valuation put on the Union Pacific would be relatively much higher than that which would be put on it on the basis of cost of physical reproduction alone, and there would be less danger that its less prosperous competitor would be ruined in the attempt to reduce the Union Pacific's earnings to what might, by anti-railway agitators, physical valuation doctrinaires and shippers regardful of their own interests, be regarded as fair.

It may be objected that it is impracticable, in making a valuation, to take accurately into account such factors as density of traffic and operating expenses. A competent engineer can make a fairly close estimate of the cost of rebuilding a mile of track, but who can say approximately how much a given density of traffic or a given cost of operation adds to the value of a mile of road? But an argument that says that approximately due weight cannot be given to all factors that should enter into valuation is not an argument against giving due weight to such factors, but an argument against making a valuation.

We have never believed that a valuation could be made that could be applied usefully or fairly in regulating the rates of all the railways of the United States or even the rates of the roads of a single state. The valuations in various states either have produced almost no effects on rates, or, as in Texas, have been unfairly made and recklessly used, and have hurt the roads and proved boomerangs to the states. But if the state and interstate commissions are to continue to make valuations as a basis for rate regulation it would seem that they should try to give due weight to all the factors that enter into the value of the roads, and should seek light not only from engineers who can tell them what it would cost to rebuild the various roads, but also from operating experts and traffic experts competent to estimate how much weight should be given, under the special conditions of each case, to operating costs and traffic density.

We should think the regulating authorities would see the desirability, from their own standpoint, of taking other factors than the cost of reproduction into account. The ground of all subsequent agitation for valuation of railways has been the statement of the Supreme Court of the United States in the case of Smyth v. Ames that "the basis of all calculations as to the reasonableness of rates * * * must be the fair value of the property being used by it (the railway) for the convenience of the public." But the court was far from saying that valuation should be based solely upon cost of physical reproduction. It mentioned as "matters for consideration" the original cost of construction, the amount expended in permanent improvements, the amount and market value of stock and bonds, the cost of reproduction, the probable earning capacity under the rates prescribed, the sum required to meet operating expenses, and added: "We do not say that there may not be other matters to be regarded in estimating the value of the property." It seems evident, from this, that if any commission or legislature should seek, by means of a valuation based on cost of physical reproduction alone, to defend low rates that it had fixed, the Supreme Court would hold the valuation worthless, and disregard it. The expense of making it would then have been put upon the public to no purpose.

FREIGHT TANK LOCOMOTIVES FOR THE PRUSSIAN STATE RAILWAYS.

An article was published in the *Railroad Gazette* April 10, 1908, giving an outline description of some freight tank locomotives for the Prussian State Railways, with especial attention to the Schmidt smoke-tube superheater with which they are equipped. A further consideration of the engines may serve to call attention to some of their interesting and characteristic features.

In the arrangement and design of details the engines may be taken as representative of German practice, and a study of them will be of value as indicating the points of resemblance and variation between it and the practice of the United States, though the reasons for variation may not always be apparent. Of course, the frame is of the typical plate design in universal use in England and on the Continent, and is the fundamental point of departure from American practice. Then, the cylinders are cast without the half saddle and are bolted to the frames. The connection and bracing between them is formed of plates and angles in what seems a rather light construction here, accustomed as we are to the heavy castings and thick ribs of the half-saddles and cross-ties. The plates used are but 0.4 in. thick, but they

have a width both for the vertical and horizontal plates that secures the requisite stiffness and strength. The draft gear, instead of taking hold of the front buffer beam and putting the load on its fastening, passes back beneath the smokebox to a short cross-bar resting on two volute springs, which, in turn, bear against a brace at the back of the saddle. This drawbar is of a round section, 2 in. in diameter, so that its working area is but 3.14 sq. in. With a tractive effort of 40,700 lbs. as calculated by the American formula, this gives a working stress of about 12,960 lbs. per sq. in. of metal. Undoubtedly this leaves an ample margin of safety, but the size seems very weak in comparison with the very heavy bars with which we are accustomed to connect engine and tender, a section of 12 sq. in. being not uncommon in engines of this size. But when all of the features of the coupling are considered the reason for this discrepancy appears. In America there is always a play or lost motion between any two adjacent freight cars, amounting to several inches of slack in a long train. When this is taken up with a jerk, the stress put upon a drawbar, of even the large size used in the United States, is often enough to break it. But with the screw coupling and spring compression buffers used in Germany, this jerking is not apt to occur, and the drawbar need only be made of sufficient size to take care of the regular tractive effort of the engine with a reasonable factor of safety. This evidently accounts for the present design.

In the smokebox we find an arrangement of netting that is not used in America, but has been developed to meet German requirements. The blower, too, is a great improvement over current practice here. We usually simply run a steam pipe into the smokebox and turn it up so that it will discharge into the stack, and make no further attempt to effect an even distribution of the draft. We have spent a great deal of time and money investigating and experimenting with the adjustment of diaphragm and netting in the smokebox so that the engine will produce the greatest amount of steam with the least possible back pressure in the cylinders and with as even a flow and distribution of the products of combustion through the tubes as can be obtained: and yet, when the blower is used, when every ounce of steam blown out counts, and time is of the utmost value, we proceed to use a blower that works as badly as possible and wastes steam and fuel in a way to make one's heart ache. The German, on the other hand, having adjusted his nozzle and netting and stack so as to put an even pull on his fire over the whole of the grate area, with an even distribution of his gases in the tubes, encircles the nozzle with a perforated pipe and thus reproduces as nearly as possible the conditions set up by the exhaust, and saves fuel, steam and time. And in doing so he has at least emphasized one of the ways not to do it.

In the *Railroad Gazette* for Nov. 29, 1907, there was an illustrated description of the pistons and valves that are used on German railways where superheated steam is used. In their experiments along these lines, the Germans have found that neither pistons, rings or stuffing boxes ought to carry the weight of the body of the piston, and for that reason tail rods are used, as in this case. Especial provision is also made for cooling the stuffing boxes by air, so that they will not become overheated, and the projecting ends of the tail rods are run in airtight sheaths to protect them from the dust that would otherwise score them. It is probably by attention to these details as much as to any other thing that the successful operation of the superheater on the Prussian roads is due; and if those progressive officials in this country who are trying to use superheaters and meeting with indifferent success would look into the arrangement of these minor details more thoroughly and carefully, it is quite probable that many of the present troubles would disappear.

The dome will be found to possess three points at variance with American practice. In the first place, the whole upper portion can be unbolted at the ring and lifted off, giving free access to the stand pipe and throttle, and evidently greatly facilitating inspection and repairs. For, instead of being obliged to work over the top of a dark hole, with the fumes of a smoky torch rising into his face, the workman has the whole thing in the open and is far less likely to shirk his job or scamp his work, than where called upon to labor under disagreeable conditions. The second point is the use of a steam separator at the dome joint. This is an inexpensive refinement that, if it does any good at all, will certainly pay for its installation. The third point is the throttle. This is of the slide valve or gridiron type that was discarded from American railroads many years ago, and it would be a hard task to secure its readoption. It is difficult to operate, presents a multitude of opportunities for sticking and wire drawing, and has but one feature superior to the balanced poppet, and that is that it is probably less expensive to fit.

Back of the dome is the sand box, small as compared with American practice, and indicating that sand is not used as lavishly in Germany as it is in the United States. The safety valves and whistle arrangements are peculiar to the country, but have no especially noteworthy characteristics, other than that they are mounted directly upon the boiler shell instead of upon a small dome on which they are usually set here. The raising of the safety valves to a point on the main or auxiliary dome is probably to be preferred to a direct connection to the shell, because of the fact that by being more remote from the water surface they will discharge dryer steam, and thus do their work more economically than where an amount of water is entrained. The same thing holds true with the whistle, with the added consideration that the dryer the steam the clearer and more penetrating the blast, and the quicker it begins to sound after the valve is opened. Further back in the roof of the cab we find a Pintsch gas lamp, which is certainly a novelty. As for the cab itself, it does not differ materially from American construction. There is a difference in the shape of the windows, and the arrangement of the side doors is different. As for the cab fittings, they present some novelties that may or may not appeal to the American observer. Speaking broadly, they do not appear to be arranged with quite so strict an observance of the requirements of handiness as might be expected. The use of the screw reversing gear is slower than the lever, but has the advantage of an accurate adjustment of the cut-off and a complete control of the mechanism at all times, which is a very decided advantage when handling heavy gears with steam on. Speed of handling is a minor matter, except in switching service, as rapid reversing is seldom required. The location of the throttle handle, with its pivot on the center line of the boiler, puts it pretty well out of reach of the engineman when occupying his stool, and then to push the lever away from him, at right angles to his line of vision, seems an awkward arrangement. It is not only out of reach, but makes the use of a single hand necessary for the performance of nearly all of the operations of the engineman. Then, too, the connections to the throttle are such that it is lowered on its face to open it, so that should a pin or connection break, the valve would drop open instead of dropping shut. This would not, necessarily, cause a disaster, but is contrary to American ideas and is illustrative of another's viewpoint.

The use of copper in the firebox is, of course, distinctly foreign to our practice, while the short brick arch and the peculiar method of forming the fire door opening, with the heavy ring for protecting the inner sheet, are variations that are interesting, although the deep ash pan, dropped down between the axle and close to the rails, quite agrees with American work. The use of the button-head stay for the crown is also a matter to which we are giving more attention than formerly, as a detail by means of which the holding

power of the bolts can probably be considerably increased. Finally, in this review of the firebox, it may be noted that the fixed grates are not what we are accustomed to.

The running gear will be found replete with novelties in the details of its arrangements. The boxes and the equivalents of the wedges, pedestals and binders differ from American practice, but in ways that are not brought out with sufficient clearness in the engraving to warrant discussion here. The use of underhung springs suggests our own work, but the adjustable screw hangers are details that have not yet found a place in American designs. But the most marked novelty in the running gear is to be found in the brake rigging. It will be seen that there are no shoes bearing on the first, third or fifth wheels, but that there are two shoes on each of the second and fourth wheels. This scheme of putting a brakeshoe on each side of the driving wheels for the purpose of relieving the boxes and rods due to their unequalized thrust, was strongly urged in the United States a number of years ago, and is used by one or two roads, but with that arrangement two shoes were put on each wheel. With the arrangement shown on this Prussian engine, the disadvantage of being able to use but two-fifths of the weight of the engine is incurred, coupled with the added liability of unequal wear of the tires due to the grinding effect of the shoes on two of the tires and the freedom of the others from such action.

These are a few of the marked points of resemblance and of contrast in German and American practice that can be seen by a study of the engine under consideration. That the contrasts would be more numerous were a more careful study to be made of the details goes without saying, but these few are sufficient to suggest the possibilities of the case, for those who wish to take up the matter with a greater thoroughness than has been possible here.

BONDS IN RAILWAY FINANCE.

At the opening of the year 1907 it seemed likely that a long "bond period" in financing railways during which issues of bonds had considerably exceeded issues of stock was likely to be reversed and stock issues forge ahead. It was just then a period of pretty high railway income when stocks were earning well and new stock likely to be taken up. The same was true of convertible bonds which had poured out in great volume and diversity while the 1906 authorizations in new stock of four companies—New York Central, Great Northern, St. Paul and Northern Pacific—had alone amounted to somewhat more than $400,000,000. Moreover, it was a period of the "undigested" bond security when the market was a good deal overloaded with bonds and there was more or less, in the case of high class dividend paying roads, a tendency to revert to new stock and the attendant "rights," or else to the convertible bond, running for longer or shorter periods to convertibility—sometimes very short—a form of bond but one degree removed from stock and only differing by a factor of time if the transfer power is exercised. We here use the term "bond" as a broad generality and including debentures, a shape which the convertible security often took on.

But the prognosis of a "stock" period at the beginning of 1907 was not realized. The mid-way of that year, which ended the fiscal twelve-month, returned bond and bond obligations of all railways of the country outstanding represented by a ratio of about 18 in bonds to 15 of stock. The short note period had also begun to play havoc with the figures embodying as it did a "tide over a crisis" policy of many corporations not all of them, by any means, railways. The later autumnal panic of 1907 naturally disturbed all omens and they were not certified by the year 1908, which was a very bad twelve-month for oracles. Now we seem to be entering a bond period once more and an intensive one. There are more than $100,000,000 of short term railway obligations to be refinanced this year and more than double that amount in 1910. And just now, in any refunding processes, as well as in issues absolutely new, demand is out-running supply. Bond sales, indeed, have been of late almost phenomenal in volume. They reach between $30,000,000 and $40,000,000 a week at the New York Stock Exchange alone, of which our rapid analysis indicates about four-fifths railway bonds. To these are to be added sales at other exchanges and private sales which presumptively reflect the same demand. Bond sales, to be sure, are not the same thing as new bond issues; but bond demand forecasts bond financing and bond transactions, which are only in minor degree speculative, are the genuine index of a situation.

The underlying cause of the exceptional bond demand is obvious. After the vicissitudes of the railways in 1908, fiscal and civic, and not yet out-lived, conservative investment naturally seeks the senior security first. The interesting point to be watched hereafter is the time element in this persistency of the bond demand and its general results in future railway capitalization. Will or will not the railway stock hold its own or gain in the fiscal race against the bond? In the long pull following the panic of 1873 we saw the railway bond—that is to say the good railway bond—appreciate, the railway stock fall. Are we at the opening of such a period now or is conservative demand, passing from the senior to the junior railway mortgage security, next to the debenture or time note, then, to overtake ere long the stock? Primarily the question is one of *net* railway earnings. If they swell and rise high the bond will probably lose its present dominance. But with the great increase of fixed charges due to a protracted bond period one looks forward with some curiosity, to say the least, to the future ratios of bonds to stocks in American railway finance. One of the immediate results of a compulsory situation has been, in the case of a good many railway presidents, the extinction of the theory of substitution of the higher but uncertain dividend charge for the lower but inexorable interest on the bond.

In this future problem of bond versus stock and their ratios there are manifestly other components. One is the maturing of convertibility in the case of a large number of convertible bonds. There are some $70,000,000 of them financed by the New York, New Haven & Hartford Railroad Company alone. To what extent will such bonds be converted? Another important but indeterminate component is the future rivalry of the industrial, street railway and municipal bonds—not to mention prospective federal issues—with those of the steam railways. That rivalry in the bond market seems, on the whole, very likely to increase as the years go on and, if it does so, will tend to establish in railway capitalization a stock and bond equation or, at any rate, level downward existing disparities. But it may also increase the interest rate on the railway bond and bring us no nearer to the ideal of a railway that pays a fair dividend almost as surely as its fixed charge. Finally, as a component of the question, is the attitude of state and national authority toward the railway which, if adverse favors the bond as compared with the stock investment and *vice versa*. We shall know more about that branch of the subject ere long. Meanwhile railway bond investment goes along with the minor railway stock investment which expresses itself in stock distribution and the cheering increase of the number of stockholders and decreased individual holding.

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Letters to the Editor.

CLEARING CAR HIRE.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

The universal practice of railways throughout the entire country of interchanging cars for the despatch of traffic has made the settlement for car hire a burdensome and annoying expense, with no end of detail in checking up between roads for adjustment. We need a better and more modern system than the one now used. .

A system has been proposed, which is settlement with direct connections daily and monthly, by crediting them each day with every car received from them and charging them with every car delivered to them, regardless of the car ownership, thus making every road its own clearing house. Statements between the lines to be made and rendered connections daily to be checked and O.K.'d by them. In this manner you will know each day exactly how many foreign cars you have on your own line and how many of your own cars are off the line and at what points cars were received and delivered; the differences between the receipts and deliveries being the debits and credits, to be added each day to the connecting line's account until the end of the month, when settlement is made.

The great trouble in contemplating this system seems to have been to establish a proper start, in other words, to be able to adjust accounts with car owners for a commencement. This seems to me to be as easy and in every way as just and proper as keeping the record after the start is obtained. To illustrate my idea I will take the Denver & Rio Grande as an example.

For instance, at 12 o'clock, midnight, on the last day of any month when it is proposed to start the system, we will suppose that the D&RG has 6,800 foreign railway cars on its system, the ownership of which includes all the railways in the country, and 4,900 of its own system cars on foreign lines. This does not include private cars which are settled for on a mileage basis. In making a start with our connections we should simply take an inventory of the 6,800 foreign railway cars on the D&RG, making a list showing the numbers, initials, date and point received from connections and also making a statement of our own 4,900 system cars off the line, showing the numbers, dates and points delivered to connections. The situation would then be as follows:

At 12 o'clock midnight last day of month.				No. of cars on first day of month	
Foreign cars on hand.			System cars off line.	We pay connect'ns	Connect'ns pay us.
Received from			*Delivered to*	*Debit.*	*Credit.*
Mo. Pac.	Pueblo	2,000	1,000	1,000	.....
C., B. & Q.	Denver	1,000	500	500	.....
C., R. I. & P...	Denver	500	400	.....	.....
C., R. I. & P...	Pueblo	700	500	.....	.....
		1,200	900	300	.....
Colo. & So.....	Denver	400	500	.....	.....
"	Pueblo	800	750	.....	.....
"	Walsens	500	500	.....	.....
		1,700	1,750	.....	50
Union Pac....	Denver	300	250	.....	.....
Union Pac....	Ogden	200	100	.....	.....
		500	350	150	.....
Ore. Sh. Line..	Ogden	300	200	.....	.....
Ore. Sh. Line..	Salt Lake....	50	100	.....	.....
		350	300	50	.....
S.P.,L.A. & S.L.	Provo	50	100	.....	50
		6,800	4,900	2,000	100
		4,900	.....	100	.....
Balance against Den. & R. G.		1,900		1,900	

It will be seen by this that we will pay our direct connections for exactly the number of foreign cars we have on the line less the number of our system cars off the line, delivered to the same connections. The statement of these cars both received and delivered being sent to our direct connections and being checked by them, should establish without question the exact condition upon which the start can be made.

A start having been made correctly, the sending of statements each day between the direct connecting lines to be checked and returned and the debits and credits added each day should make the system almost perfect and a settlement could be made at any time.

If all railways throughout the country would adopt this system they would each pay for exactly the number of foreign cars they have on their system and receive pay for exactly the number of their system cars off their lines. It matters not between connections whose cars they handle or on what lines their own cars are, the adjustment under this plan would regulate itself. It seems to me that a system of this kind would simplify the work of car accounting and end most of the troubles in delay in checking up. Settlement could be made in full for all cars when you settle with your direct connections.

While this system of settling for car hire and per diem is up, there is another thing which I wish to mention and that is a more modern method of settling for what are now known as reclaims. At present where one road delivers cars to another for loading or unloading, where there is a switching charge made for the service the road performing the switching service reclaims on the delivering road for the equivalent in per diem to the time consumed by the switching road where the car is being loaded or unloaded and returned to the delivering line. This is a nuisance which should be done away with at the earliest possible moment as it is nearly always the source of contention and delays, making settlements often run for months. The remedy, in my opinion, is quite simple and as easy as the proposed method of settling for per diem.

My proposition is for the switching road to add the per diem reclaim to the switching bill when the charge for switching the car is made. It could be added and collected at the same time as the switching charge, and that the switching bill may not be made large and objectionable to the Interstate Commerce Commission, the amount could be shown on the switching bill as a separate item, collected in the same manner as the switching bill and credited through the railway's own office to car hire account.

If these two proposed methods could be adopted the difficulties in per diem settlement would be nearly over. I have not gone extensively into detail because it seems apparent to me that every car accountant would understand the merits of the propositions without further explanation. During my railway experience I have found it difficult to introduce a modern and improved system, but it seems to me that the above is worthy of consideration and should lead to something better than we have.

E. M. HORTON,
Car Accountant; Denver & Rio Grande.

DEMURRAGE AND FREE TIME.

Pittsburgh, Pa., February 19, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

With reference to the communication of "Woolly West," as published in your issue of February 12.

While reading it I was reminded of a conference between railway representatives and representatives of a Merchants' Exchange, held for the purpose of solving the question of reasonable rules and regulations to apply to cars that were exceptionally handled. The whole situation was thoroughly developed, and the last thing presented by one of the exchange representatives was that the railways had practically allowed them the world, with a down-hill pull, and were now demanding that they should reorganize their business in 30 days.

The railways cannot attain to ideal service by promulgating rules to be drastically applied. Railways' rules and regulations, to the end of improved car movement, must follow the line of least resistance, the rules being accepted as reasonable rules, to the end of an improvement in conditions. Practically, a railway is a clearing house between the producer and the consumer, and it must work in harmonious relation-

ship with the developed practice of the commercial interests.

In giving consideration to demurrage, you must not only consider the loading and unloading of the car, but you must consider all the commercial practices that have been generally adopted by the country at large. It cannot be maintained that those practices are ideal, but it must be admitted that the practices have been adopted, and the conditions because of those practices must be considered, and if rules and regulations are introduced, to the end of reformation where practices are bad, there must be an exhibit of the bad practice and the results that ensue.

"Woolly West" says that the free time for loading and unloading should be cut in half; that the dollar per day is not an equivalent for the service performed. As an abstract proposition, it must be admitted that 48 hours is an unreasonable length of time for the detention of cars for loading or unloading; that $1 is not an equivalent for the value of the car in service, but you must not lose sight of the fact that, if rules are properly applied, the average time is much less than 48 hours, and, additionally, that, although the dollar is not an equivalent for the earning capacity of the car, it is about all the public will stand in the nature of a fine for breach of contract after the secondary relationship has been established, although the public may eventually appreciate the fact that it is in their interest that a larger charge should be assessed, if it can be demonstrated that the larger charge will move the car.

Again referring to the 48 hours free time allowed, calculated from the first 7 a.m. after the car is placed. If there should be an attempt to reduce the time below 48 hours, the difficulty the railways would encounter would be in keeping records that would develop the exact time of detention.

Forty-eight hours is not the time allowed on all cars, but it is agreed upon that no charge will be made on any one car until after the expiration of 48 hours, that time having been established as a reasonable time in the courts.

If every consignee's endeavor was to hold each and every one of his cars for 48 hours, instead of endeavoring to unload all cars received inside of 48 hours, the railways would have to solve the problem of applying rules in a reasonable manner with less time.

Forty-eight hours is simply a compensating time; it is a give and take as between the railways and the consignees, and when the public admit that it is a reasonable time and make reasonable preparation for the loading and unloading of the car, they will, and do, load and unload over 50 per cent. of the cars in less than one day.

Referring to your correspondent's statement that there is no obligation on the part of the carrier to give free use of the equipment for storage purposes, that the practice is entirely voluntary. To the contrary, the railways insist that the public should unload their cars within a given period, and they deprecate any procedure on the part of the public where the car is detained beyond the maximum limit of the free time allowed without charge, and the demurrage rules are in evidence as proof positive of that, as, when forced into a secondary relationship, they will apply a charge of $1 per car per day, or fraction of a day.

What we lack in this country is a thorough understanding, both by the railways and by the public as to what are reasonable rules and regulations, to be enforced along the line of least resistance, those rules to be developed in accord with the actual practice both of the railways and of the public.

When we arrive at a practical agreement, there is an immediate decrease in the average time consumed in unloading the car, which is followed by a decrease in the time consumed by the railway for service. It is of record, in the Pittsburgh territory, that, with the same number of cars in actual service, handling ore in the lake-and-rail trade, the railways doubled the tonnage handled, the consignee having determined that all unnecessary delay to the car was detrimental to his individual interests, and that prompt unloading of a car after delivery was followed by sequence in service.

Demurrage rules should be only to one end—improved car movement, and the railway cannot improve the movement of the car when on its rail if the public fails in an understanding of the necessity for co-operation. They must do their part. The consignor, the railway and the consignee are vitally interested in the interdependent service in both loading, transporting and in the unloading of the car. All must pull together if service is to be improved and satisfaction attained to.

Demurrage rules, and practice under the rules, must be developed along the line of mutual interest, and it must not be forgotten that the charge, whether $1 a day, or $2 or $3 a day, is, in the language of the courts, a charge in the nature of a penalty; in other words, it is a fine for breach of contract; consequently, the rules must be applied just as any police law is applied, and they must fully cover all conditions surrounding the service of the railway, the service of the loader and unloader, the service that is agreed upon where cars are moved under a privilege, or where cars are distributed, or where a necessary preliminary time must be granted in order to equalize the rule as towards all consignees, from the largest plant to the smallest dealer, insuring to all alike the same time.

I have found that, when the public understand that these rules are in their interest, antagonism is practically eliminated, the result being a quasi-agreement between the railways and the public, to the end of mutual benefits.

No railway can be benefited unless the rules as applied benefit its patrons.

W. M. PRALL.

ELECTRIC HEADLIGHTS.

New York, February 11, 1909.

To the Editor of the Railroad Age Gazette:

The article in your issue of January 22, reporting a discussion at the Southern & Southwestern Railroad Club, sets forth in all necessary fullness the arguments in favor of the use of 2,000-candle-power electric headlights on locomotives, with powerful reflectors. Knowing the views of many of your readers, and with a view to giving a fair exhibit of the facts in connection with headlights of different intensities, I take the liberty of giving you herewith some of the considerations on the other side of the question. At the hearing before the Railroad Committee of the Georgia Senate, preliminary to the passage of the compulsory law in that State, some very interesting testimony was given by railway officers who opposed the bill.

These officers were practically unanimous in their testimony that electric headlights do not increase the safety of trains; they do prevent enginemen from distinguishing signals on opposing trains; they sometimes make colored lights appear white; they increase danger in yards because of their blinding brilliancy; they daze animals, causing them to stand motionless on the track until struck by the locomotive; they are expensive to install and maintain; they have been tried and abandoned by the Pennsylvania and other large roads.

The General Manager of the Georgia Railroad Company testified that the use of electric headlights on his road had not lessened accidents. He quoted in confirmation of this view Mr. Higgins, General Manager of the New York, New Haven & Hartford, who also said that the lights were objectionable on double-track; they blind the enginemen of opposing trains. Vice-President Potter, of the Baltimore & Ohio, said that this difficulty on double-track was the main objection of that company to the electric headlight. On the Philadelphia, Wilmington & Baltimore, where lights were used for a time, people living along the line objected to having the intense light thrown into their windows. The use of powerful lights and reflectors has been forbidden on electric cars in some cities.

It was shown that the Central of Georgia, with 150 engines equipped with electric headlights, paid $42,000 for animals killed by trains in the year 1907, as against less than $10,000 in 1899 with ordinary headlights. The light seems to paralyze cattle with fear. Mr. Gaines, Superintendent of Motive Power, estimated that an electric headlight would cost $230 a year as compared with $40 for an oil headlight. These figures do not include depreciation. The Central had stopped putting on electric headlights because they found no special advantage in their use. R. E. Smith, of the Atlantic Coast Line, said that his company had tried electric headlights on a number of engines; if they had been found useful in reducing the accidents the company would have increased their use without waiting for a compulsory law.

Otto Best, of the Western & Atlantic, explained how the lights blind enginemen and often make red lights appear white. Several other railway officers gave testimony which need not be here rehearsed, confirming that which I have quoted.

T. H. Curtis, Superintendent of Machinery of the Louisville & Nashville, in a report which was sent to the Legislature of Alabama, showed how a red, green or white light, like those used on trains, held at the side of an electric headlight, would be invisible to a person standing 500 ft. away. An electric headlight in a yard is a nuisance, almost obliterating hand lanterns. In rain or mist the effect on enginemen's vision is annoying, often producing a curtain of light which it is almost impossible to see through. Mr. Curtis told of his experience on the highway in an automobile equipped with two powerful acetylene lamps. These would make visible a carriage 500 ft. away, but on meeting an electric street car equipped with an arc light, he was temporarily made totally blind. From the time that he got within 1,000 ft. of such a car he found himself so dazzled that it was dangerous to keep the automobile moving. His acetylene lights were overcome by the electric.

Electric headlights are of no practical advantage to the man on the engine behind them, because, first, they do not enable him to see objects around curves, and, second, they cannot be depended upon to make visible fixed signals a long enough time before reaching them to make it practicable for the engineman to depend on them. CYRUS.

TIGHTENING THE GRASP OF GOVERNMENT.

Iowa City, Iowa, February 27, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

I am not sure that Mr. Graves' letter published in your issue of February 19 will do much harm because its spirit is so evidently far from that of the careful student of railway affairs seeking the truth—but, being by training and early affiliation much interested in the ultimate success of all legitimate railway enterprises, I sometimes wonder if these enterprises are not in more danger from their friends than their foes. I am therefore disposed to answer Mr. Graves very briefly.

Granted that the majority of American railways are not overcapitalized, I think that even Mr. Graves will concede that some American railways *are* overcapitalized; that a western railway that is capitalized at over $100,000 a mile, and whose stock is worth six or seven in the market is overcapitalized, and that any railway capitalized at more than the capitalized value of its absolutely safe net excess of receipts over expenditures is overcapitalized.

Possibly one may safely assert that the American people as a whole are honest; but there are robbers and thieves among them, and laws and courts and jails designed to protect the honest from the dishonest are deemed to be necessary and have been established. Probably it is safe to say that the average American banker is honest and wise in his business methods, but it is certain that not all are honest or wise, and out of the experience of the past have grown laws to protect the honest banker and the confiding and impotent single citizen from the dishonest banker.

There are people—many of them besides those mentioned by Mr. Graves—who believe in, and demand, a wholesome and just regulation of railway business that will protect the honest railway management from the dishonest management; that will protect again the confiding and impotent single stockholder from the selfish and dishonest manipulator, and that, finally, will protect the honest railway management from the constantly recurring attacks of the selfish, ambitious, ignorant or unprincipled politician. WILLIAM G. RAYMOND,

Dean of the College of Applied Science, State University of Iowa.

[We have high respect for Dean Raymond's ethical standards, and an excellent opinion of his judgment, but we think he is confusing theoretic overcapitalization with actual overcapitalization. We are inclined to doubt if anybody can say whether a new project is overcapitalized or not; the test is operation. If the Humdrum Valley Railway, facing competition, either of carriers or of markets, real or potential, is able to pay its charges, and to earn five per cent. on its stock, we maintain stoutly that it is not overcapitalized, and the simplicity of this method of calculation lies in the fact that we do not know, nor want to know, how much it cost to build the road, what the replacement value is, or how much stock is outstanding.—EDITOR.]

Contributed Papers.

TIME-TABLE RIGHTS ABOLISHED ON A BURLINGTON SINGLE TRACK LINE.

The use of the space interval system on single track lines, under regulations which permit the abolition of time-table rights and of written and repeated train orders, is now to be seen not only with the train staff, as on the Southern Pacific, and under the Beamer system, as on the Northern Pacific, but also with controlled manual block signals, with track circuit throughout the section; this on the Chicago, Burlington & Quincy.* The Burlington has this time-saving arrangement in use on five block sections (not all on the same division) and is preparing to adopt it on six more. An officer of the road writes:

We have at present three sections of single track between Kansas City and Napier, Mo., operated under the controlled manual system. Each forms a connection between double tracks on either side. These three sections are 11, 4 and 7 miles in length, the 11-mile section being divided into two blocks. The average train movement consists of twenty passenger and from twelve to sixteen freight trains per twenty-four hour period.

The movement of trains upon these sections is first authorized by the train despatcher, and his action is followed by the concurrent action of the signal men at each end of each block, preceding the admittance of a train to a block. Two block instruments, one at each end of the block, are so interlocked with each other and with the signals controlling admittance of trains to the block at either end, as to require consultation and agreement between the two signal men preceding the permission of either signal man to the other to admit a train.

The signals are locked also through the medium of the track circuit, if the block is already occupied by another train, the track circuit being maintained the whole length of each block. The presence of a train in the block also controls the block instruments, depriving the signal man at either end of the power of unlocking the other, and both from clearing a signal or admitting another train.

In the sections referred to the trains are governed exclusively as to their right to proceed by the indication of block signals,

*The abolition of time-tables and standard train orders on a two-mile single-track line safeguarded by automatic signals alone was reported in the *Railroad Age Gazette* of February 19, page 372.

the signals superseding all time-table and train order rights.

The maximum use of tracks is thus obtained, as unavoidable time-table and train order waits are done away with, and the maximum economy of time secured. A similar installation is in operation between Quincy, Ill., and Moody, Mo., a distance of five miles, where the volume of traffic is about the same as that on the sections before mentioned.

Four six-mile consecutive sections are about ready to be put in operation on the main line between Red Oak and Balfour, Iowa, between long stretches of double track on either side.

The result of the operation of the "controlled manual and semi-automatic" block system is to increase the capacity of the line 25 per cent. This is the judgment of those who have operated the same tracks under previous methods. The controlled manual apparatus is similar to that used on other parts of the road where the track circuit feature is not introduced.

EMPLOYMENT, TRAINING AND ADVANCEMENT OF MEN.*

BY J. S. PYEATT,
Superintendent, Pere Marquette.

Of the manifold problems met by the operating officer none can concern him more than the selection of his men, their education and proper training, to insure the highest possible development of good character, loyalty and competency so necessary in his organization; and I believe a majority are ready to admit that some assistance is needed beyond that of immediate subordinates to investigate, in a more thorough and systematic manner, the record, habits, and general fitness of each individual taken into the service, to whom responsibility in its varied degrees must ultimately gravitate. For this purpose, a number of roads have established separate departments—notably the Erie, Great Northern and Burlington—that carefully collect and preserve information as to the record, experience, physical condition, etc., of their employees, and I am informed very satisfactory results are produced. While it is true that most of the roads conduct a sort of perfunctory investigation of the record of men employed on certain work, it is too indifferently handled to be of much value, and often not concluded until the defects of the applicant have been demonstrated by experience, and frequently at considerable loss to the company in money and reputation. Even the most careful employer, possessing unusual ability to judge men quickly, will be mistaken and employ men who would not be considered, if their past records were known, which, perhaps, are not fully divulged until months later.

I suggest that the Superintendent and Trainmaster should, so far as practicable, encourage the employment of young men with homes at or near their work—sons of station agents, conductors, engineers, section foremen, etc., old in the service, who will, by their associations, have gained at least an elementary knowledge of the work when they begin, and enter the service with a feeling of loyalty and interest in the company, and a determination to succeed, accentuated by the encouraging influence of their family connections, that should be very valuable. By placing them with old, experienced men, they soon master the details of their duties and can be depended upon in emergencies with greater reliance than others more or less indifferent as to where they reside or work. The correspondence school has assisted materially, when adequately encouraged and supported, in educating all classes of railroad men, especially for work requiring the application of a technical knowledge that the employee has not had the opportunity of gaining in schools before beginning his work.

Until recently, the employer has not been free to exercise a very critical attitude toward applicants by reason of the scarcity of all kinds of labor; but now that conditions are reversed—the supply so far exceeding the demand—an opportune time is afforded to gradually dispense with the services of men lacking in efficiency, loyalty, and interest in their work; who encumber rather than assist, and exercise a degrading influence over their fellow workers. By so doing, your company is not only benefited by being relieved of an objectionable class, but the example to those remaining may impress upon them the idea that a day's work, instead of a day's time, shall be given for a day's pay, and that their interests are best served by devoting unreserved energy and thought to their work rather than the superficial article with which we have had to deal during the past few years of unrivaled prosperity. It is not contended that labor organizations and their purposes are totally bad—on the contrary they have done much good, both to their members and employers, by specializing work, condemning irregular conduct and encouraging education, when properly and conservatively advised by the leaders; but during the late prosperous period, immoderate demands have been made, not alone for advanced pay, but for various privileges and concessions far more vital to the roads, since their tendency has in many cases been toward a less regard for discipline, and a growing indifference to rules and orders, the effect of which—reflected by the Interstate Commerce Commission Bulletins—is appalling to the public and to the railroad managers as well, who have been hampered beyond measure in their efforts to check it.

Public opinion, which has contributed so conspicuously toward the difficulty experienced in dealing with the men and the organizations representing them, it is cheerful to note, is beginning to realize the fallacy of its prejudice against railroads, and its too liberal sympathy for the rank and file of men working for them, regardless of the question at issue, and will, I hope, assist toward bettering conditions by substituting for the present lawmaker, who has gained pre-eminence by agitating the "sins of the trusts" and the "woes of labor" (with never a thought or impulse higher than his own selfish interests) real men, who will see not only the misdeeds of corporations, but the abusive power of labor trusts, and regulate both with the conviction that all have rights, and each can commit a wrong. To enforce the law of seniority for promoting men, popularly urged by professional labor leaders, is as unfair as to assume that all men are created mental and physical equals, and if followed must inevitably put men into positions of responsibility to which they can never well adapt themselves; while others capable of doing the work are restrained from accepting it, and their spirit and ambition is thus hampered and practically destroyed.

The primary purpose of every employer should be to create and preserve harmony between the men and their immediate superiors and to develop and promote enthusiasm in their work. To insure this, fair and reasonable treatment is always the first essential, augmented by firm, consistent discipline, an aggressive policy, and the same disposition to commend good conduct and good work as to condemn misconduct and poor work. No man will do his best who is unfailingly criticised for his mistakes with never a praise for his successes. In my opinion we will eventually accomplish the greatest good toward educating and training men, harmonizing the differences between capital and labor, employers and employees, and reuniting all, so far as may be, upon one common ground, by adopting a co-operative plan in some practical form, not based on any of the many intangible theories conveniently classed under Socialism, but one similar perhaps to that worked out by the United States Steel Corporation, whereby the fruits of good work and good organization can, in a measure, be shared by all, and conspicuous effort, ability, and loyalty recognized in a substantial way; thus defining broadly the difference between excellence and mediocrity, thrift and idleness, industry and indifference, and generating a spirit of competition that will develop the full capacity of men and give the greatest benefit and gain to both company and individual.

*A paper read at the annual meeting of the Central Association of Railroad Officers, Peoria.

HIGH STEAM-PRESSURES IN LOCOMOTIVE SERVICE.

BY W. F. M. GOSS,
Dean of the College of Engineering, University of Illinois.

IV.

BOILER PRESSURE AS A FACTOR IN ECONOMICAL OPERATION.

23. *The amount of steam consumed* by the locomotive per unit power developed, when operated under various pressures between the limits of 120 and 240 lbs., has already been defined (Fig. 12). Basing conclusions on results thus disclosed, it is now proposed to determine the increase in efficiency which may be secured through the adoption of higher pressure for any given increase in the weight of the boiler and its related parts. That this may be done, it is essential to determine the relation between boilers of a given size when designed for different pressures.

24. *Weight of Locomotive as Affected by Steam-Pressure.*—The parts of a locomotive which are affected by changes in steam-pressure, assuming the power to remain constant, are the boiler and certain portions of the engine. The boiler to be adapted to a higher steam-pressure requires thicker plates, heavier riveting and stronger staying, all tending to augment its weight. The effect of the change upon the engine, however, is to make it lighter, for since with increased pressure, cylinders, pistons, and valves become smaller, their weight will generally diminish. As a basis for exact values, defining their relationship, lines were laid down for a boiler of the following dimensions:*

TABLE 4.—*Weight of Those Parts of a Locomotive which are Affected by Changes in Boiler Pressure.*

Boiler Pressure	Weight of Boiler pounds	Weight of Cylinders, Valves, and Pistons pounds	Weight of Water pounds	Weight of All Parts Affected by Changes in Pressure pounds
1	2	3	4	5
160	30679	12580	16349	59608
190	32913	12240	16536	61689
220	36076	11990	16661	64727
250	38953	11620	16848	67421

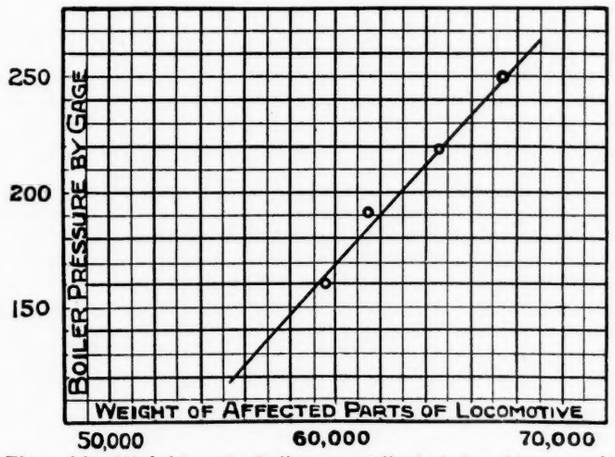


Fig. 14—Weight of Boiler as Affected by Changes in Pressure.

Diameter of first ring .....63 in.
No. of 2 in. tubes. 258
Length of tubes .....14 ft.
Total heating surface .....2,024 sq. ft.
Length of grate .....90 in.
Width of grate .....60 "
Area of grate .....37.5 ft.
Boiler pressure .....190 lbs.

Four designs were made, adapted to four different pressures, respectively, from which designs weights were calculated, with results shown by Table 4.

*These and other determinations involve weights of boilers which were supplied by the courtesy of the American Locomotive Company.

The weight of the cylinders, valves, and pistons which would be used with a boiler having 2,024 sq. ft. of heating-surface in making up a representative locomotive carrying the different pressures designated is set forth in Column 3. The weight of water when the boiler is filled to the second gage appears as Column 4. The weight of steam is negligible. The total weight of all parts of the locomotive directly affected by the changes in pressure is given in column 5, and the values of this column, for the purpose of interpolation, have been plotted in terms of steam-pressure, with results as set forth by Fig. 14.

With these data it is proposed to show the extent to which the performance of a typical locomotive using saturated steam may be improved by increasing the pressure carried within its boiler. For convenience, six different pressures having values between 120 and 220 lbs. will be utilized as bases from which to assume an increase of pressure. The increase of pressure from each base will be such as may be possible upon the allowance of definite increments in the weight of those portions of the locomotive affected by pressure, and in like manner the improvement in performance will be expressed as a per cent. of that which is normal to the base. The results of the process outlined are presented in Table 5. An explanation of the columns of this table whose meaning is not self-evident follows:

TABLE 5.—*Total Saving When a Possible Increase of Weight is Utilized as a Means of Increasing Boiler Pressure.*

Increase of Weight per cent	Boiler-pressures Selected as Bases pounds	Weight of Those Parts of a Locomotive Which Are Affected by Changes in Boiler-pressure pounds	Weight of Affected Parts Increased by per cent Given in Column 1 pounds	New Boiler-pressure Obtainable by Utilizing the Increase of Weight in Making a Stronger Boiler, pounds	Steam per Indicated Horse-power per Hour at the Pressures Given in Column 2, pounds	Steam per Indicated Horse-power per Hour at the New Pressures Given in Column 5, pounds	Direct Saving in Steam Consumption Resulting from an Increased Weight Equal to per cent. Shown in Column 1, per cent	Indirect Saving Due to Reduced Rate of Evaporation, per cent	Total Saving per cent
1	2	3	4	5	6	7	8	9	10
5	120	55560	58340	150	29 1	27.1	6.87	1 67	8.54
	140	57390	60260	171	27.7	26.3	5.05	1.23	6.28
	160	59220	62180	192	26.6	25.7	3.39	.82	4.21
	180	61050	64100	213	26.0	25.2	3.08	.75	3.83
	200	62880	66020	234	25.5	24.8	2.75	.67	3.42
	220	64710	67940	255	25.1	24.5	2.39	.58	2.97
10	120	55560	61120	181	29.1	26.0	10.65	2.59	13.24
	140	57390	63130	203	27.7	25.4	8.31	2.02	10.33
	160	59220	65140	225	26 6	25.0	6.02	1.46	7 48
	180	61050	67150	247	26.0	24.6	5.38	1.31	6.69
15	120	55560	63890	211	29.1	25.3	13.06	3.17	16.23
	140	57390	66000	234	27.7	24.8	10.46	2.51	13.00
	160	59220	68100	257	26.6	24.5	7.90	1.92	9.82
20	120	55560	66670	241	29.1	24.7	15.12	3.67	18.79

Column 3. *Weight of those parts of a typical locomotive affected by changes in steam pressure, including water in boiler.*—The values of this column, for each of the several pressures stated in Column 2, are taken directly from the diagram of Fig. 14, the basis of which has already been explained.

Column 5. *New boiler-pressure obtainable by utilizing the increase of weight in making a stronger boiler.*—The values in this column for each of the several weights stated in Column 4 were taken from the diagram in Fig. 14.

Column 6. *Steam per indicated horse-power per hour at the pressures given in Column* 2.—Values for this column are taken directly from the curve of Fig. 12.

Column 7. *Steam per indicated horse-power per hour at the new pressures given in Column* 5.—These values, also, were taken directly from the diagram (Fig. 12).

Column 8. *Direct saving in steam consumption, resulting from an increased weight equal to the per cent. shown in Column* 1.—Values of this column are equal to 100 times those of Column 6 minus those of Column 7 divided by those of Column 6.

Column 9. *Indirect saving due to reduced rates of evaporation, per cent.*—Assuming the locomotive to work at the same power at whatever pressure it may carry, the saving in steam

resulting from the increased pressure set forth in Column 8 diminishes the demand upon the boiler, and, as the efficiency of the boiler increases as the rate of evaporation is reduced, there results an indirect saving with each increase of pressure. The relation between the evaporative efficiency of the boiler and rate of evaporation has already been defined (Fig. 9). Assuming the normal rate of evaporation for the boiler under initial conditions to be 10, then a reduction of 1 per cent. in the rate of evaporation will effect an increase in the evaporative efficiency of 0.243 per cent. The values in Column 9, therefore, are those of Column 8 multiplied by the constant 0.243.

Column 10. *Total saving.*—The total saving is the sum of Columns 8 and 9.

The significance of this table may best be appreciated by the following examples:

By line 1 of the table it appears that the base is 120 lbs. (Column 2). The parts of the typical locomotive designed for this pressure, which are affected by changes in steam-pressure, weigh 55,560 lbs. (Column 3). If, now, in designing a new lot of locomotives, it becomes possible to increase this weight by 5 per cent. (Column 1), the weight of these parts for the new locomotive may be 58,340 lbs. (Column 4). This weight, if put into a boiler of the same capacity, will allow the pressure to be increased from 120 lbs. (Column 2) to 150 lbs. (Column 5), and as a result its steam consumption per horsepower hour will fall from 29.1 lbs. (Column 6) to 27.1 lbs. (Column 7), or 6.87 per cent. (Column 8). But the saving of 6.87 per cent. in steam consumption diminishes the demand which is made upon the boiler for steam, and at the lower rate of evaporation the boiler becomes 1.67 per cent. (Column 9) more efficient, giving a total gain as a result of the change in pressure of 8.58 per cent. (Column 10). In a similar manner each line of the table presents a measure of the improvement to be expected from some definite increase of pressure.

A study of the analysis which has preceded will show that the values of Column 10 may be accepted as fairly representing the increase in efficiency which may be secured in return for a given increase in steam-pressure, or, as is more clearly shown by Table 4, in return for a given increase in the weight of those parts of the locomotive affected by increase of pressure.

While the comparison is based on improved efficiency, it will, of course, be understood that, at the limit, the saving shown may be converted into a corresponding increase of power. It would have been possible by assuming constant efficiency to have shown the improvement in terms of increase of power.

VII.

BOILER CAPACITY AS A FACTOR IN ECONOMICAL OPERATIONS.

25. *In the preceding chapter there is considered the advantage to be derived* through the utilization of any possible increase in the weight of a locomotive, as a means by which to secure an increase of pressure. It is the purpose of this chapter to consider the benefit which may be derived by utilizing similar increments in weight to secure an increase in boiler capacity, the pressure remaining constant. The weights of boilers and related parts involved by such a comparison have been ascertained from considerations similar to those which controlled in the preceding case. A boiler of the dimensions already given (paragraph 24), designed for 190 lbs., was made the starting-point from which values were ascertained for boilers of different capacities designed to carry 160 lbs. pressure. The characteristics of the several boilers thus designed are set forth in Table 6.

TABLE 6.—*Characteristics of Four Boilers Designed for 160-Lbs. Pressure and Different Capacities.*

Diameter of Boiler inches	Number of 2-inch Tubes	Length of Tubes feet	Length of Grate inches	Width of Grate inches	Area of Grate sq. ft.	Area of Heating-surface sq. ft.	Weight of Boiler pounds	Weight of Water in Boiler pounds	Weight of Parts of Locomotive Which Are Affected by Changes in Heating-surface pounds
1	2	3	4	5	6	7	8	9	10
63	258	14	90	60	37.4	2024	30,679	16,349	47,028
67	338	16	102	65	46.1	3013	41,013	20,092	61,105
69	326	14	102	65	46.1	2538	36,321	19,344	55,665
70	396	16	96	75	50.0	3498	42,894	21,965	64,859

The steam-pressure being constant, the dimensions and consequently the weight of the cylinders and related parts for the development of a given power remain unchanged. It is obvious, also, that since the only change in the locomotive is in the size of its boiler, the cylinder performance will be the same for locomotives having boilers of different sizes. The saving which will result from the employment of boilers of greater capacity will be only that which results from the diminished rate of evaporation per unit area of heating-surface. The relation of evaporative efficiency and rate of evaporation has already been defined (Fig. 9), so that both factors in the problem now are known, namely, the increase in weight necessary for a given increase in capacity and the effect of any increase in capacity in improving the evaporative efficiency. By means of relations thus established values have been determined which are presented in Table 7. An explanation of the columns of this table whose meaning is not self-evident is as follows:

TABLE 7.—*Saving When a Possible Increase of Weight is Utilized as a Means of Increasing Heating Surface.*

Increase of Weight per cent	Boiler-pressures Selected as Bases pounds	Weight of Parts of a Typical Locomotive (Boiler, Cylinders, Valves, Pistons, and Water) pounds	Allowable Increase of Weight pounds	Heating-surface of Typical Locomotives Whose Weights Are Given in Column 3 sq. ft.	Increase of Heating-surface Obtainable by Utilizing Increase of Weight in Making a Larger Boiler sq. ft.	Increase of Heating-Surface per cent	Saving in Evaporative Performance Due to Reduced Rate per cent
1	2	3	4	5	6	7	8
5	120	55560	2778	2000	234.7	11.73	2.85
	140	57390	2869	2000	242.5	12.12	2.95
	160	59220	2961	2000	250.1	12.50	3.04
	180	61050	3052	2000	257.7	12.88	3.13
	200	62880	3144	2000	265.3	13.26	3.22
	220	64710	3235	2000	272.9	13.64	3.31
10	120	55560	5556	2000	469.4	23.47	5.70
	140	57390	5739	2000	484.9	24.24	5.89
	160	59220	5922	2000	500.4	25.02	6.08
	180	61050	6105	2000	515.9	25.79	6.27
15	120	55560	8334	2000	704.2	35.21	8.55
	140	57390	8608	2000	727.3	36.36	8.84
	160	59220	8883	2000	750.6	37.53	9.12
20	120	55560	11112	2000	939.0	46.95	11.41

Column 3 is the weight of boiler, the contained water, and the cylinders, pistons, and valves. While the cylinders, pistons, and valves do not change for any given pressure, their weights are included to make the values comparable with those employed in the analysis of the preceding chapter. They are in fact identical with the values of Column 3, Table 5.

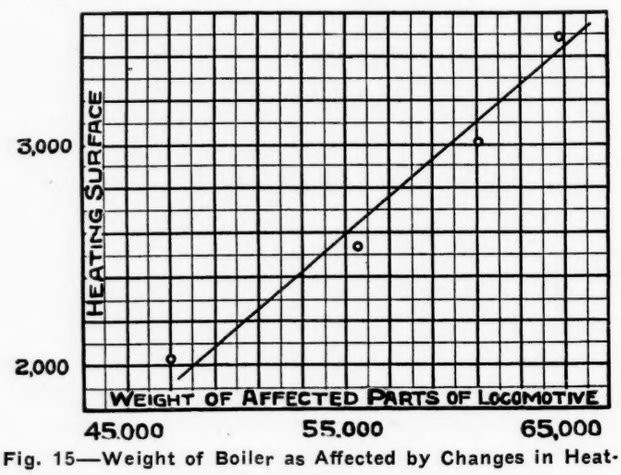


Fig. 15—Weight of Boiler as Affected by Changes in Heating Surface.

Column 4. *Allowable increase in weight.*—The values of this column are the percentages indicated by Column 1 of the values of Column 3.

Column 6. *Increase of heating-surface.*—Values for this column have been obtained by plotting weight of affected parts in terms of heating-surface (Columns 7 and 10, Table 5). The results appear in Fig. 15. From a representative line drawn through points thus obtained showing the relation between the weight of the boiler and water, and the number of square feet of heating-surface, it can be shown that an increase of 10,000 lbs. in the weight of boiler and affected parts permits an increase of 845 sq. ft. in heating-surface. Therefore, in Table 6, Column 6 equals Column 4 multiplied by 0.0845. This relation was obtained from data of a boiler designed for 160 lbs. pressure and is assumed to be approximately true for boilers of other pressures.

Column 7. *Increase of heating-surface, per cent,* is Column 6 multiplied by 100 divided by Column 5. It also shows the per cent. reduction in the rate of evaporation.

Column 8. *Saving in evaporative performance due to reduced rate, per cent.*—Values in this column have been obtained from those of the preceding column by means of a relationship already established controlling evaporative efficiency of boiler and rate of combustion. (Fig. 9). This relation is such that a reduction of 1 per cent. in the rate of combustion increases the evaporative efficiency 0.243 per cent. Values of Column 8 are, therefore, those of Column 7 multiplied by this factor.

The significance of Table 6 will be understood from the following illustration, based upon the first line of the table. Assuming an existing locomotive operating under a pressure of 120 lbs. (Column 2) to have a boiler containing 2,000 sq. ft. of heating-surface (Column 5) weighing with the contained water 55,560 lbs. (Column 3), an increase of 5 per cent. (Column 1) or 2,778 lbs. (Column 4), will permit an extension in heating-surface of 234.7 sq. ft. (Column 6) which, compared with its original surface in an increase of 11.73 per cent. (Column 7). This increase in the extent of heating-surface, assuming the power developed to remain unchanged, will result in an improvement in the performance of the boiler of 2.86 per cent. (Column 8). The facts underlying the analysis are primarily the results of tests.

(To be continued.)

SOUTHERN RAILWAYS AND THEIR NEEDS.*

BY JOHN F. WALLACE.

For the purposes of this address the South is described as that portion of the United States lying south of the Potomac and Ohio rivers and east of the Mississippi.

Shortly after the close of the Civil War, the South, realizing the changed order of things, accepted the situation in the spirit of American manhood and started on a new era of industrial and commercial development.

One of the first necessities was a comprehensive system of transportation facilities. The railways, which prior to the Civil War, had compared favorably with those in the North, at its close were practically bankrupt financially and physically, and were more the shadow than the substance of what they should have been.

Southerners with brains and energy, starting with 11,587 miles of detached, dilapidated and crippled railways, immediately commenced to lay the foundation of the present industrial and commercial prosperity in the South by reconstructing its lines of railway.

The efforts of these men and the confidence they were able to inspire in northern and foreign capital are best illustrated by the fact that to-day the South is served with 46,434 miles of railway, serving 11 states, 20 million people, and representing a total investment in round numbers of two billion dollars.

Of these 46,434 miles of railways, only 1,134 miles approximately, or 2½ per cent., are double track. It is possible that the next ten years will see at least one-fourth, or over 10,000, additional miles of second track.

It must be borne in mind that while transportation is the burden bearer of both production and commerce, it is only able to perform the full and complete measure of its functions when properly nourished and assisted by finance.

In ancient days the birth of civilization started with the ability to preserve food products. This grew from the temporary necessity of accumulating sufficient food to last from one chase to another, or to enable journeys to be performed or winter climates endured, to the storage of vast quantities of food to enable nations to survive years of famine, as was exemplified by the storage of grain in Egypt in the days of Joseph, which period history shows us was the crowning epoch of Egyptian civilization.

To-day the measure of our modern civilization is our transportation system. It has been our custom in America to anticipate future needs in transportation, and in a measure attempt to forestall and provide for them. The policy of foreign countries has been practically the reverse. The railway systems of England and of Europe have been built to take care of and supply a demand for transportation facilities that already existed.

The railways of the United States in the South and West have been projected and built, and to a great extent financed, by men whose inspiration was a firm belief in an unseen future and whose assets were largely composed of hope and an undying faith in the future development of their country.

The railway of to-day is no sooner completed as a single track, than it becomes necessary to provide industrial spurs; additional or enlarged terminals; replace its temporary structures by permanent ones; widen its excavations; strengthen its embankments; provide passing tracks, additional shop facilities enlarged passenger and freight stations, warehouses, elevators, docks and wharves at water terminals, additional tracks, heavier rail, rock ballast, elimination of curves, reduction of grades, block signals, elimination of grade crossings, heavier engines, larger and better cars, to the end that the constantly growing requirements and exactions of modern traffic conditions may be met; all of which requires increased expenditures, which it is easily seen could not in any event be provided for out of earnings.

During the next ten years the railways of the South will require $1,000,000,000 to enable them to fully provide for the increased demands for transportation facilities, an average of $100,000,000 per annum. Including the estimated increased mileage and the present capital investment, the resulting average capitalization would amount to $53,000 per mile, being $20,000 per mile under the present average capitalization of all the railways of the United States to-day, which is $73,000 per mile.

Meeting the requirements of the railway situation in the South by the expenditure of a round billion dollars during the next ten years as outlined above, would make the total investment in southern railways at the end of that period three billions of dollars on an estimated mileage of 56,000.

It would require average earnings of $9,000 gross per mile per annum, with operating expenses at 70 per cent. of the gross, to yield sufficient net income to provide a return of 5 per cent. on this total investment.

When these figures are compared with the present average gross earnings of the railways of the United States, of $11,400 per mile per annum, with an average cost of operation of $7,757 per annum, resulting in a ratio of operating expenses to gross earnings of 68 per cent. the above estimates appear reasonable and conservative.

Even if this expenditure is made and the results predicted

*From an address before the Southern Commercial Congress, Washington, D. C.

obtained at the end of the ten-year period, southern railways will still fall approximately 25 per cent. short of yielding the present average gross earnings per mile per annum of the railways of the United States to-day.

To provide funds to meet these ever-growing and incessant demands for additional facilities, the railway companies must necessarily be large borrowers.

The prosperity of the South in the next decade, and in those to follow after, depends upon the ability of the owners and managers of southern railways to foresee and provide for future necessities, and upon the promptness with which the work is accomplished.

The ability of railways to make these improvements, which are so essential to the future prosperity of the South, depends upon the willingness of capital to furnish the necessary funds for the purpose.

While legislation may control and regulate the returns upon invested capital, there is no process by which it can compel that investment originally. While investment is easily retarded it is difficult to attract. There is probably no form of capital investment more open to attack or more liable to depreciation through unfair or unwise legislation than the railway investments of to-day.

While the speaker is a firm believer in the principles of government control and supervision over the corporate entities which have been created by the people and for the people, it must not be forgotten that every shield has its reverse, and that the exercise of such control and supervision must necessarily be along the lines of right and justice, which no mere legislative enactment can change. Any variance brings its own reward, which frequently spells disaster.

The power to control, regulate and supervise necessarily carries with it responsibilities from which there can be no escape. Every tax, every restriction, every requirement which costs money or reduces revenue to our southern railways is a tax which must ultimately be paid by the communities which they serve. The prosperity of the southern railways and the prosperity of the South are irrevocably bound together, and the needs of the South are identical with the needs of the railways.

The basis of securing capital must necessarily be the ability of the borrower to inspire confidence in the lender that his capital will ultimately be returned to him intact, and that he will receive regularly and promptly adequate hire therefor.

No section of our great country has such reputation for united action as the South. In political matters this unity of action for years has led to the designation "The Solid South." What the railways in this section need to-day is a solid South behind and beneath them; a solid South taking a calm and rational view of the immense factor the railways have been and always will be in the development of its future greatness. The recent reversion of sentiment in the state of Georgia, brought about by a calm and deliberate analysis of the present situation by the business men of that state, should be the keynote of the future action of the solid South.

The adoption of a policy of fairness and liberality towards the railroad interests on behalf of all the southern states, and the ability to convince the financial world that this action is sincere and genuine and will be permanent, is the great paramount need of the railways of the South to-day.

Prompt action along these lines will enable the railway companies of this section successfully to compete in the markets of the world for the capital needed to carry out the improvements outlined, and thus provide the facilities which will enable the producers of the South to ride the crest of the wave of coming prosperity.

In its calls for capital the southern railways must come into competition in the markets of the world, not only with the railway requirements of the North, of the East and the West, but with all the lines of human industry and endeavor throughout the wide world.

The difference between the 5 or 6 per cent. paid by southern railways for the money which goes into their additional facilities or equipment, and the 3 or 4 per cent. which may be yielded by the high-class world investments is merely the gage by which the confidence of the capitalist is measured in the integrity of his investments.

I might talk to you for hours about the evil and unfairness of legislative enactments to retard and make unproductive railway investments; of the injustice of any body of men attempting by legislation, without giving the railway corporations proper hearing, to arbitrarily adjust their rates of toll for either passenger or freight, simply because politicians consider it a popular thing to do.

I might suggest a multitude of things which could be done to increase the credit of railways throughout your section. I might mention a multitude of things which have been done to injure and impair and prevent railways securing the necessary capital to provide for their needs. I might also attempt to enumerate the ill-advised actions of railway managers and employees toward the public. I might expatiate upon the foolishness and unwisdom of a corporation—the creature of the public—attempting to dictate to its master or declining to obey its commands.

It is doubtful, however, if the enumeration of the errors and shortcomings of the fellow-members of the same family ever tends to a better understanding or more harmonious relationships. The need of the hour is a recognition of the interdependent relations which exist between us all, and to remember—intensely, actively, potently remember—that an injury to one is an injury to all.

SAFETY VALVE CAPACITY.

BY PHILIP G. DARLING, M.A.S.M.E.

The function of a safety valve is to prevent the pressure in the boiler to which it is applied from rising above a definite point, to do this automatically and under the most severe conditions which can arise in service. For this, the valve or valves must have a relieving capacity at least equal to the boiler evaporation under these conditions. If they have not this capacity, the boiler pressure will continue to rise, although the valve is blowing, with a strain to the boiler and danger of explosion consequent to over-pressure. Thus with the exception of a requisite mechanical reliability, the factor in a safety valve bearing the most vital relation to its real safety is its capacity.

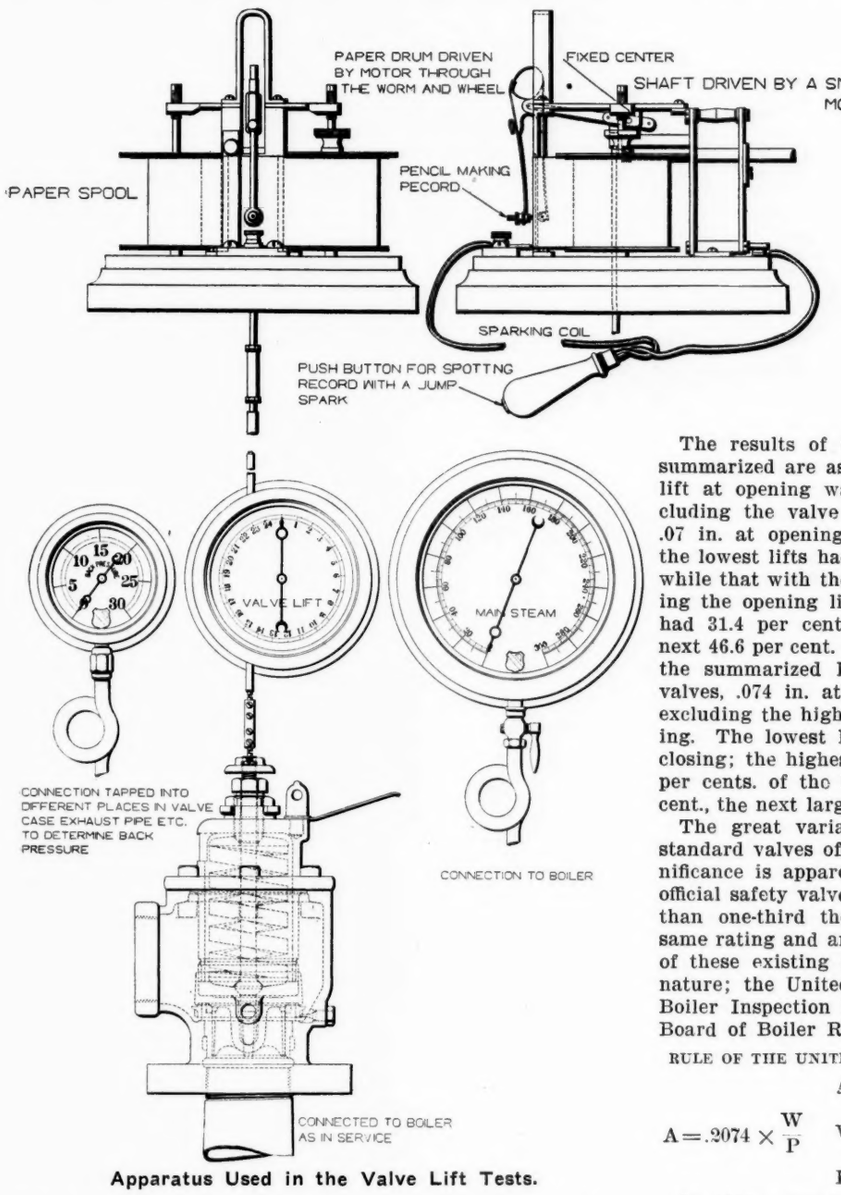
It is the purpose of this paper to show an apparatus and method employed to determine safety valve lifts, giving the results of tests made with this apparatus upon different valves; to analyze a few of the existing rules or statutes governing valve size and to propose a rule giving the results of a series of direct capacity tests upon which it is based; its application to special requirements, and finally to indicate its general bearing upon valve specifications.

Two factors in a safety valve geometrically determine the area of discharge and hence the relieving capacity; the diameter of the inlet opening at the seat and the valve lift. The former is the nominal valve size, the latter is the amount the valve disc lifts vertically from the seat when in action. In calculating the size valves to be placed on boilers, rules, which do not include a term for this valve lift, or an equivalent, such as a term for the *effective* area of discharge, assume, in their derivation, a lift for each size valve. Nearly all existing rules and formulas are of this kind which rate all valves of a given nominal size as of the same capacity.

To find what lifts standard make valves actually have in practice and thus test the truth or error of this assumption that they are approximately the same for the same size valve, an apparatus has been devised and tests upon different makes of valves conducted. With this apparatus not only can the valve lift be read at any moment to thousandths of an inch, but an exact permanent record of the lift during the blowing of the valve is obtained somewhat similar to a steam engine indicator card in appearance and of a quite

similar use and value in analyzing the action of the valve.

As appears in the accompanying engraving, the valve under test is mounted upon the boiler in the regular manner, and a small rod is tapped into the top end of its spindle, which rod connects the lifting parts of the valve directly with a circular micrometer gage, the reading hand of which indicates the lift upon a large circular scale or dial. The rod through this gage case is solid, maintaining a direct connection to the pencil movement of the recording gage above. This gage is a modified Edson recording gage with a multiplication in the pencil movement of about 8 to 1, and with the chart drum driven by an electric motor of different speeds, giving a horizontal time element to the record. The steam pressures are noted and read from a large test gage graduated in pounds per square inch, and an electric spark device makes it possible to spot the chart at any moment, which is done as the different pound pressures during the blowing of the valve are reached. The actual lift equivalents of the pencil heights upon the chart are carefully calibrated so the record may be accurately measured to thousandths of an inch.



Apparatus Used in the Valve Lift Tests.

In testing, the motor driving the paper drum is started and the pressure in the boiler raised. The valve being mounted directly upon the boiler, then pops, blows down and closes under the exact conditions of service, the pencil recording on the chart the history of its action.

With this apparatus, investigations and tests were started upon seven different makes of 4-in. stationary safety valves, and these tests were followed with similar ones upon nine makes of muffler locomotive valves, six of which were 3½ in., all the valves being designed for and tested at 200 lbs. The stationary valve tests were made upon a 94 h.p. water-tube boiler made by the Babcock & Wilcox Co. The locomotive valve tests were made upon locomotive No. 900 of the Illinois Central Railroad, the valve being mounted directly upon the top of the main steam dome. This locomotive is a consolidation, having 50 sq. ft. of grate area and 2,953 sq. ft. of heating surface. Although a great amount of additional experimenting has been done only the results of the above will be quoted in this paper. These lift records show (with the exception of a small preliminary simmer, which some of the valves have) an abrupt opening to full lift and an almost equally abrupt closing when a certain lower lift is reached. Both the opening and closing lifts are significant of the action of the valves.

The results of the 4-in. iron body stationary valve tests summarized are as follows: Of the seven valves the average lift at opening was .079 in. and at closing .044 in., or excluding the valve with the highest lifts, the averages were .07 in. at opening and .037 in. at closing. The valve with the lowest lifts had .031 in. at opening and .017 in. at closing, while that with the highest had .137 in. and .088 in. Expressing the opening lifts as per cents of the highest, the lowest had 31.4 per cent., the next larger 40.8 per cent., and the next 46.6 per cent. Of the six 3½-in. muffler locomotive valves, the summarized lifts are as follows: Average of the six valves, .074 in. at opening and .043 in. at closing. Average excluding the highest, .061 in. at opening and .031 in. at closing. The lowest lift valve had .04 in. opening and .023 in. closing; the highest .140 in. opening and .102 in. closing. As per cents. of the highest, the lowest lift valve was 36.4 per cent., the next larger 39.8 per cent. and the next 46.4 per cent.

The great variation—300 per cent.—in the lifts of these standard valves of the same size is startling and its real significance is apparent when it is realized that under existing official safety valve rules these valves, some of them with less than one-third the lift and capacity of others receive the same rating and are listed as of equal relieving value. Three of these existing rules are given as an illustration of their nature; the United States Supervising Inspectors' Rule, The Boiler Inspection Rule of Philadelphia, and the Rule of the Board of Boiler Rules of Massachusetts.

RULE OF THE UNITED STATES BOARD OF SUPERVISING INSPECTORS.

$$A = .2074 \times \frac{W}{P}$$

A = area of safety valve in sq. in. per sq. ft. of grate surface.
W = lbs. of water evaporation per sq. ft. of grate per hour.
P = boiler pressure (absolute).

In 1875 a special committee was appointed by this Board to conduct experiments upon safety valves at the Washington Navy Yard. Although the pressures used in these experiments (30 x 70 lbs. per sq. in.) were too low to make the results of much value to-day, one of the conclusions reported is significant.

"First.—That the diameter of a safety valve is not an infallible test of its efficiency.

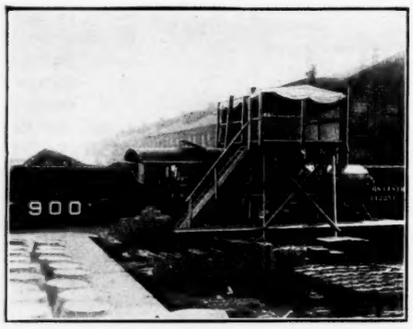
"Second.—That the lift which can be obtained in a safety valve, other conditions being equal, *is* a test of its efficiency."

The present rule of the board as given above, formulated by Mr. L. D. Lovekin, Chief Engineer of the New York Shipbuilding Co., was adopted in 1904. Its derivation assumes practically a 45 deg. seat and a valve lift of $\frac{1}{32}$ of the nominal valve diameter. The discharge area in this rule is obtained by multiplying the valve lift $\frac{D}{32}$ by the valve circum-

ference ($\pi \times D$) and taking but 75 per cent. of the result to allow for the added restriction of a 45 deg. over a flat seat. The 75 per cent. equals approximately the sine of 45 deg., or .707. This value for the discharge area, i.e. ($.75 \times \pi \times \frac{D^2}{32}$) is substituted directly into Napier's formula for the flow of steam $W = a \times \frac{P}{70}$. Thus in the valves to which this rule is applied the following lifts are assumed to exist:

1 in. valve.. .03 in. 3 in. valve.. .09 in. 5 in. valve.. .16 in.
2 in. " .. .06 in. 4 in. " .. .13 in. 6 in. " .. .19 in.

Referring back to the valve lifts, it is seen that the highest lift agrees very closely with the lift assumed in the rule and if the valve lifts of the different designs were more uniformly of this value or if the rule expressly stipulated either that the lift of $\frac{1}{32}$ of the valve diameter actually obtain in valves qualifying under it or that an equivalent discharge area be obtained by the use of larger valves, the rule would apply satisfactorily to that size of valve. However, the lowest lift valve actually has but ¼, the next larger less than ½, and the average lift of all but the highest lift valve, which average is .07 in., is but 56 per cent. of the lift assumed in the rule for these 4-in. valves.



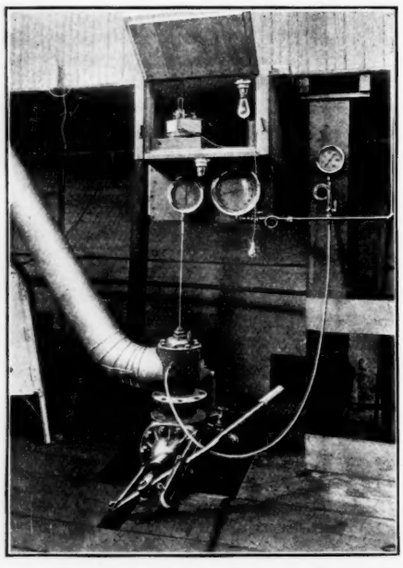
View of Locomotive in Burnside Tests.

MASSACHUSETTS RULE OF 1909.

$$A = \frac{W \times 70}{P} \times 11$$

A = total area of safety valve or valves in sq. in.
W = lbs. of water evaporation per sq. ft. of grate surface per second.
P = boiler pressure (absolute).

One of the most recently issued rules is that contained in the pamphlet of the new Massachusetts Board of Boiler Rules, dated March 24, 1908. This rule is merely the United States rule given above with a 3.2 per cent. larger constant and hence requiring that amount larger valve. The evaporation term is expressed in pounds per second instead of per hour and two constants are given instead of one, but when reduced to the form of the United States rule it gives $A = .214 \times \frac{W}{P}$ Figuring this back as was done above with the United States rule and taking the 75 per cent. of the flat seat area as there done, shows that this rule assumes a valve lift of $\frac{1}{33}$ of the valve diameter instead of the $\frac{1}{32}$ of the U. S. rule. This changing of the assumed lift from $\frac{1}{32}$ to $\frac{1}{33}$ of the valve diameter being the only difference between the two rules, the inadequacy of the U. S. rule just referred to applies to this more recent rule of the Massachusetts Board.

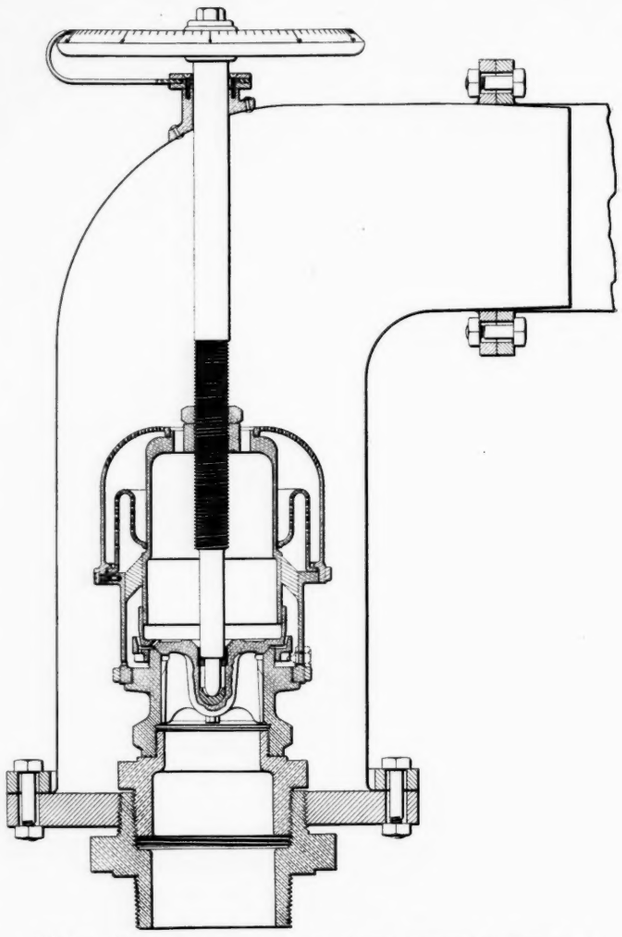

Apparatus Used in Laboratory Tests.

PHILADELPHIA RULE.

$$A = \frac{22.5\ G}{P \times 8.62}$$

A = area of safety valve in sq. in. per sq. ft. of grate.
C = grate area in sq. ft.
P = boiler pressure (gage).

The Philadelphia rule now in use came from France in 1868, being the official rule there at that time and having been adopted and recommended to the city of Philadelphia by a specially appointed committee of the Franklin Institute, although this committee frankly acknowledged in its report that it "had not found the reasoning upon which the rule had been based." The area (a) of this rule is the effective valve opening, or, as stated in the Philadelphia ordinance of July 13, 1868, "the least sectional area for the discharge of steam." Hence if this rule were to be applied as its derivation by the French requires, the lift of the valve must be known and considered whenever it is used. However, the example of its application given in the ordinance as well as that given in the original report of the Franklin Institute Committee, which recommended it, show the area (a) applied to the nominal valve opening. In the light of its derivation this method of using it takes as the effective discharge area, the valve opening itself, the error of which is very great. Such use, as specifically stated in the report of the committee above referred to, assumes a valve lift at least ¼ of the valve diameter, i.e., the practically impossible lift of 1 in. in a 4-in. valve.


Valve Arrangement in the Direct Capacity Tests at Barberton.

The principal defect of these rules in the light of the preceding tests is that they assume that valves of the same nominal size have the same capacity, and they rate them the same without distinction, in spite of the fact that in actual

practice some have but ⅓ of the capacity of others. There are other defects, as have been shown, such as varying the assumed lift as the valve diameter, while in reality with a given design the lifts are more nearly the same in the different sizes, not varying nearly as rapidly as the diameters. And further than this the lifts assumed for the larger valves are nearly double the average actually obtained in practice.

The direct conclusion is this, that existing rules and statutes are not safe to follow. Some of these rules in use were formulated before, and have not been modified since, spring safety valves were invented, and at a time when 120 lbs. was considered high pressure. None of these rules takes account of the different lifts which exist in the different makes of valves of the same nominal size, and they thus rate exactly alike valves which actually vary in lift and relieving capacity over 300 per cent. It would therefore seem the duty of all who are responsible for steam installation and operation to no longer leave the determination of safety valve size and selection to such statutes as may happen to exist in their territory, but to investigate for themselves.

The elements of a better rule for determining safety valve size exist in Napier's formula for the flow of steam, combined with the actual discharge area of the valve as determined by its lift. In "Steam Boilers," by Peabody & Miller, throughout the testing upon all points of the feed, and steam lines to insure that all water measured in the calibrated tanks was passing through the tested valves without intermediate loss.

The valves tested consisted of a 3-in., 3½-in. and a 4-in. iron stationary valve, and a 1½-in., 3-in. and 3½-in. locomotive valve, the latter with and without mufflers. These six valves were all previously tested and adjusted on steam. Without changing the position of the valve disc and ring the springs of these valves were then removed and solid spindles threaded (with a 10 pitch thread) through the valve casing above inserted. Upon the top end of these spindles, wheels graduated with 100 divisions were placed. The engraving shows the arrangement used with the locomotive valves, the spindle and graduated wheel being similar to that used with the stationary valves. By this means the valve lift to thousandths of an inch was definitely set for each test and the necessity for constant valve lift readings with that source of error eliminated.

In conducting the tests three hours duration was selected as the minimum time for satisfactory results. Pressure and temperature readings were taken every three minutes, water readings every half hour. A man stationed at the water glass regulated the feed to the boiler to maintain the same level

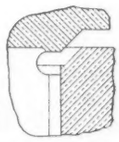
SAFETY VALVE CAPACITY TESTS.

Run at the Stirling Works of the Babcock & Wilcox Co., Barberton, Ohio, November 30 to December 23, 1908.

Test No.	Duration of test.	Size and type of valve	Adjustment remarks.	Valve lift, in.	Pressure, lbs. per sq.in.	Superheat, deg. F.	Discharge—Per hr., lbs. of steam.	Discharge—Area.* sq. in.	Remarks.
6	3 hrs.	4-in. R.F. iron stationary.	Reglr. adj., exhaust piped.	0.0695	151.7	43.6	5,120	0.623	No back pressure.
7	3 "	4-in. " " "	" " " "	.139	145.4	45.1	8,600	1.255	Back pressure 2 lbs.
8	3 "	4-in. " " "	" " " "	.180	135.7	49.2	11,020	1.704	Bk press. 3 lbs.; max. press.; lift > depth of seat.
9	3 "	4-in. " " "	" " " "	.1045	149.4	41.9	7,290	.9400	Back pressure, 1 lb.
10	2½"	3½ locomotive Type R.	" " without mufflr	.140	146.7	39.0	8,685	1,109	Tests 10 to 12, inclusive, with an open locomotive valve.
11	3 "	3½ " "	" " " "	.070	152.5	38.0	4,670	.5493	
12	3 "	3½ " "	" " " "	.105	150.3	41.2	6,780	.8280	
13	3 "	3½ " Type S.	" " with muffler.	.1395	146.3	38.1	8,400	1.106	Muffler valve in this and following locomotive tests.
14	2 "	3½ " "	" " " "	.140	52.2	51.3	3,620	1,109	Test at low steam pressure.
15	2½"	Do.; with lipped feather.	" " " "	.140	146.4	39.0	8,600	1.109	Different type of valve disc.
16	3 "	4-in. R.F. iron stationary.	" " exhaust piped.	.140	138.5	42.3	8,770	1.265	No bk press.; rep. of test No. 7.
17	3 "	4-in. " " "	Adj. ring one turn 1/16-in. above reglr position.	.140	142.0	50.1	8,900	1.265	Bk. press., 3 lbs.; ring pos. chngd.
18	2 "	1½ locomotive Type S.	Reglr. adj. with muffler.	.107	140.8	23.0	2,515	.4272	
19	1 "	1½ " "	" " " "	.060	151.2	None.	1,550	.2038	Tests 18-21, inc., unsatisfactory; valve too small for boiler used.
20	2½"	1½ " "	" " " "	.075	146.3	None.	2,025	.2560	
21	2½"	1½ " "	" " " "	.075	147.7	None.	1,975	.2560	
22	1½"	3½ R. F. iron stationary.	" " exhaust piped.	.070	146.8	42.6	4,320	.5493	No back pressure.
23	3 "	3½ " " "	" " " "	.140	139.9	43.9	8,360	1.136	No bk press.; lift > depth of seat.
24	3 "	3½ " " "	" " " "	.105	141.6	48.7	6,300	.8280	
25	3 "	3 " " "	" " " "	.130	140.1	48.4	6,370	.8846	Tests 24 to 27, inclusive, no back pressure.
26	3 "	3 " " "	" " " "	.100	142.8	45.6	5,160	.6770	
27	2 "	3 " " "	" " " "	.070	142.4	29.5	3,705	.4716	
28	3 "	3 locomotive Type S.	" " with muffler.	.130	138.4	48.7	7,060	.8846	
29	3 "	3 locomotive Type S.	" " with muffler.	.090	139.3	43.9	4,950	.6034	

*The valves all having 45 deg. bevel seats these areas are obtained from formula: $a = 2.22 \times D \times l + 1.11 \times l^2$; except where, as in test Nos. 8, 18, 23, 25, the valve lift is greater than the depth of the valve seat, where the following formula is used: $a = 2.22 \times D \times d + 1.11 \times d^2 + \pi \times D \times (l - d)$.
a = discharge area (sq. in.). D = valve diameter (in.). l = valve lift (in.). d = depth of valve seat (in.).

NOTE.—The four wings of the valve feather or disc probably reduce the flow slightly, but as these are cut away at the seat (see sketch) a definite correction of the exit areas for them is impossible. Further, the formula constants are desired for the valves as made.



this method of determining the discharge of a safety valve is used. The uncertainty of the coefficient flow, that is, of the constant to be used in Napier's formula when applied to the irregular steam discharge passages of safety valves has probably been largely responsible for the fact that this method of obtaining valve capacities has not been more generally used. To determine what this constant or coefficient of flow is and how it is affected by variations in valve design and adjustment, an extended series of tests has recently been conducted at the Stirling Department of the Babcock & Wilcox Co., at Barberton, Ohio.

A 373 h.p. class K. No. 20 Stirling boiler, fired with a Stirling chain grate, with a total grate area of 101 sq. ft. was used. This boiler contained a U type of superheater designed for a superheat of 50 deg. F. The water feed to this boiler was measured in calibrated tanks and pumped (steam for the pump being furnished from another boiler) through a pipe line which had been blanked wherever it was impossible with stop valves and intermediate open drips to insure that there was no leakage. The entire steam discharge from the boiler was through the valve being tested, all other steam connections from the boiler being either blanked or closed with stop valves beyond which were placed open drip connections to indicate any leakage. A constant watch was kept in the boiler during the test, other men were stationed, one at the water tanks, one firing and one taking the pressure and temperature readings. Pressure readings were taken from two test gages connected about 4 in. below the valve inlet, the gages being calibrated both before and after the series of tests was run and corrections applied. In all, 29 tests were run; 15 were 3 hours long, four 2½ hours, three 2 hours and seven of less duration.

Tests numbered 1 to 5 were preliminary runs of but one hour or less duration apiece, and the records of them are thus omitted in the accompanying table which gives the lifts, discharge areas, average pressure and superheat, and the steam discharge in pounds per hour of each of the other tests. The discharge areas have been figured for 45-deg. seats from the formula $a = 2.22 \times d \times L$ plus $1.11 \times L^2$; where a equals the effective area in sq. in., D equals the valve diameter in inches, and L equals the valve lift in inches. In tests 8 and 23, where the width of valve seat was .225 in. and .185 in. respectively, and the valve was thus slightly above the depth of the valve seat, the area was figured for this condition.

As previously stated, the application of these results is in fixing a constant for the flow of Napier's formula as applied to safety valves. The formula is $W = A \frac{P}{70}$, in which W

equals pounds discharged per second, P equals the absolute steam pressure behind the orifice or under the valve, and a equals the effective discharge opening in sq. in. This may be stated as $E = C \times a \times P$; in which E equals the pounds steam discharged per hour and C equals a constant, E, a and P being given for the above tests C is directly obtainable.

Figuring and plotting the values of this constant indicates the following conclusions:

(1). Increasing or altering the steam pressure from approximately 50 to 150 lbs. per sq. in. (tests 14 and 10) does not affect the constant, this merely checking the applicability of Napier's formula in that respect.

(2). Radically changing the shape of the valve disc outside of the seat at the huddling or throttling chamber, so-called, does not affect the constant or discharge. In test 15 the valve had a downward projecting lip deflecting the steam flow through nearly 90 deg., yet the discharge was practically the same as in tests 10 and 14, where the lip was cut entirely away, giving a comparatively unobstructed flow to the discharging steam.

(3). Moving the valve adjusting ring through much more than its complete adjustment range does not affect the constant or discharge. (Tests 16 and 17.)

(4). The addition of the muffler to a locomotive valve does not materially alter the constant or discharge. There is but 2 per cent. difference between tests 10 and 13.

(5). Disregarding the rather unsatisfactory 1½-in. and 3-in. locomotive valve tests, the different sizes of valves tested show a variation in the constant when plotted to given lifts of about 4 per cent.

(6). There is a slight uniform decrease of the constant when increasing the valve lifts.

The variations indicated in the last two conditions are not large enough, however, to materially impair the value of a single constant obtained by averaging the constants of all the 24 tests given. The selection of such a constant is obviously in accord with the other four conditions mentioned. This average constant is 47.5, giving as the formula ($E = 47.5 \times a \times P$). Its theoretical value for the standard orifice of Napier's formula is 51.4, of which the above is 92½ per cent.

To make this formula more generally serviceable, it should be expressed in terms of the valve diameter and lift, and can be still further simplified in its application by expressing the term E (steam discharged or boiler evaporation per hour) in terms of the boiler heating surface or grate area. For the almost universal 45-deg. seat the effective discharge area is, with a slight approximation ($L \times \text{sine } 45 \times \pi \times D$), in which L equals the valve lift vertically in inches and D the valve diameter in inches. Substituting this in the above formula gives $E = 47.5 \times L \times \text{sine } 45 \times \pi \times D \times P$, or $E = 105.5 \times L \times D \times P$.

The slight mathematical approximation referred to consists in multiplying the ($L \times \text{sine } 45$) by ($\pi \times D$) instead of by the exact value ($\pi \times D$ plus ½ L). To find directly the effect of this approximation upon the above constant, the values for E L D and P from the tests have been substituted into the above formula and the average constant re-determined, which is 108.1. The average lift of all the tests is .111 in. Plotting the constants obtained from the above formula in each test, as ordinates, to valve lifts, as absissae; obtaining thus the slight inclination referred to in condition 6, and plotting a line with this inclination through the above obtained average constant 108.1, taken at the .111 average lift gives a line which, at a maximum lift of say .14 in. gives a constant of just 105. At lower lifts this is slightly larger. Hence 105 would seem to be the conservative figure to adopt, as a constant in this formula for general use, giving

$$E = 105 \times L \times D \times P.$$

This transposed for D gives:

$$D = .0095 \times \frac{E}{L \times P}$$

Note that the nominal valve *area* does not enter into the use of this formula and that if a value of 12 for instance is obtained for D it would call for two 6-in. or three 4-in. valves. For flat seats these constants become 149. and .0067 respectively.

The fact that these tests were run with some superheat (an average of 37.2 deg. Fahr.) while the majority of valves in use are used with saturated steam, would, if any material difference exists, place the above constants on the safe side. The capacities of the stationary and locomotive valves, the lift test results of which have been summarized, have been figured from this formula, taking the valve lifts at opening and in pounds of steam per hour, are as follows:

Of the seven 4-in. iron body stationary valves, the average capacity at 200 lbs. pressure is 7,370 lbs. per hour, the smallest capacity valve (figured for a flat seat) has a capacity of 3,960 lbs., the largest is 12,400 lbs., and of the six 3½-in. muffler locomotive valves at 200 lbs. pressure, the average capacity is 6,060 lbs. per hour, the smallest 4,020 lbs., the largest 11,050 lbs.

To make the use of the rule more direct where the evaporation of the boiler is only indirectly known, it may be expressed in terms of the boiler heating surface or grate area. This modification consists merely in substituting for the term E (lbs. of total evaporation) a term H (sq. ft. of total heating surface) multiplied by the lbs. of water per sq. ft. of heating surface which the boiler will evaporate. Evidently the value of these modified forms of the formula depends upon the proper selection of average boiler evaporation figures for different types of boilers and also upon the possibility of so grouping these boiler types that average figures can be thus selected. This modified form of the formula is

$$D = C \times \frac{H}{L \times P}$$

in which H equals the total boiler heating surface in sq. ft. and C equals a constant.

Values of the constant for different types of boilers and service have been selected. These constants are susceptible, of course, to endless discussion among manufacturers, and it is undoubtedly more satisfactory where any question arises to use the form containing the term E itself. Nevertheless, the form containing the term H is more direct in its application, and it is believed that the values given below for the constant will prove serviceable. In applying the formula in this form rather than the original one, containing the evaporation term E, it should be remembered that these constants are based upon average proportions and hence should not be used for boilers in which any abnormal proportions or relations between grate area, heating surface, etc., exists.

For cylindrical multitubular, vertical and water-tube stationary boilers a constant of .068 is suggested. This is based upon an average evaporation of 3½ lbs. of water per sq. ft. of heating surface per hour, with an overload capacity of 100 per cent., giving 7 lbs. per sq. ft. of heating surface, the figure used in obtaining the above constant.

For water-tube marine and Scotch marine boilers, the suggested constant is .095. This is based upon an overload or maximum evaporation of 10 lbs. of water per sq. ft. of heating surface per hour.

For locomotive boilers, .055 is taken, this constant having been determined experimentally, as explained below. In locomotive practice there are special conditions to be considered which separate it from regular stationary and marine work. In the first place the maximum evaporation of a locomotive is only possible with the maximum draft obtained when the cylinders are exhausting up the stack, at which time the throttle is necessarily open. The throttle being open is drawing some of the steam and therefore the safety valves on a locomotive can never receive the full maximum evaporation of the boiler. Just what per cent. of this maximum evaporation the valve must be able to relieve under the most severe conditions can only be determined experimentally. Evidently the severest conditions occur when an engineman after a long, hard, up-hill haul with a full glass of water and full pressure, reaching the top of the hill, suddenly shuts off his throttle and injectors. The work on the hill has gotten the engine steaming to its maximum and the sudden closing of throttle and injectors forces all the steam through the safety valves. Of course, the minute the throttle is closed the steaming quickly falls off and it is at just that moment that the severest test upon the valves comes.

A large number of service tests has been conducted to determine this constant. The size of the valves upon a locomotive has been increased or decreased until one valve would

just handle the maximum steam generation, and the locomotive heating surface being known, the formula was figured back to obtain the constant. Other special conditions were considered, such as the liability in locomotive practice to a not infrequent occurrence of the most severe conditions; the exceptionally severe service which locomotive safety valves receive; and the advisability on locomotives to provide a substantial excess valve capacity.

As to the method of applying the proposed safety valve capacity rule in practice, manufacturers could be asked to specify the capacity of their valves, stamping it upon them as the opening and closing pressures are now done. This would necessitate no extra work further than the time required in the stamping, because for valves of the same size and design giving practically the same lift this would have to be determined but once, which of itself is but a moment's work with a small portable lift gage which is now manufactured. The specifying of safety valves by a designing engineer could then be as definite a problem as is that of other pieces of apparatus. Whatever views are held, as to the advantages of high or low lifts, there can be no question, it would seem, as to the advantage of knowing what this lift actually is, as would be shown in this specifying by manufacturers of the capacity of their valves. As to the feasibility of adopting such a rule (which incorporates the valve lift) in statutes governing valve sizes, this would involve the granting and obtaining by manufacturers of a legal rating for their valve designs based upon their demonstrated lifts.

This paper has dealt with but one phase of the subject of safety valves, in order that its conclusions might be drawn more clearly. The apparatus and tests shown indicate that the lifts and capacities of different make valves of the same size and for the same conditions vary as much as 300 per cent., and that there is therefore the liability of large error in specifying valves in accordance with existing rules and statutes because these rules, as shown, rate all valves of one size as of the same capacity, irrespective of the above variation. A simple rule, based upon an extended series of direct capacity tests, is given, which avoids this error by incorporating a term for the valve lift. Finally, the method and advantage of applying this rule in practice has been briefly indicated.

THE FIRST BLOCK SIGNAL SYSTEM IN AMERICA.

BY J. A. ANDERSON.

The first system of block signals for controlling train movement, in America, was devised and put in operation by the late Ashbel Welch, General President and Chief Engineer of the United New Jersey Canal & Railroad Companies, who also, as recently stated in the columns of the *Railroad Age Gazette*, introduced from England the first plant installed in this country of interlocking switches and signals.

The system devised by Mr. Welch was based upon a principle the reverse of that before used for the protection of trains by fixed signals, which new principle is now accepted as correct, and the apparatus was arranged with particular reference to preventing disaster from oversight or carelessness. His plan is discussed at length in a report made by him to a railroad convention in New York, October 17, 1866, in which he says that it had been in use for a year past between Philadelphia and New Brunswick, on the main passenger route between New York and Philadelphia.

Much of the contents of this report, with other interesting matter, appears in a letter written by him, on August 24, 1878, from which the following is quoted:

"In the year 1863 I devised and put in operation, on the railway between New Brunswick and Philadelphia, a system of safety signals now in operation between Jersey City and Pittsburg. The principle upon which it was made you will find set out in my report three years later to a railroad convention at New York, a copy of which I send you by this mail. The cardinal principle is set out in pages 3 and 4 and the system is described in pages 5 and 7.

"At the time I put this system in operation I had never heard of the English Block System, although I afterwards knew accounts of it had been published.

"The Block System used at that time was radically different from mine. If a train did not pass a station when it should, notice was telegraphed back to the next station to stop, or block, the next train till further notice.

"The radical fault of this system was that if the operator was not on the alert, or, if the apparatus failed to work, or if the notice sent back was unobserved or not rightly understood, all of which were liable to happen, then no warning was given and a collision was much more likely to happen than if no warning was expected.

"I have been assured by the best authority that in this way collisions did occur and that some experts doubted whether the danger was not increased.

"I do not know how far the English Block System has been modified so as to substantially coincide with mine.

"Many terrible accidents have occurred on other roads since these signals have been in use, which would have been prevented had the same system been adopted by those roads.

"The principle announced in this little pamphlet was deemed of so much importance by Prof. Henry that he sent copies to several of the principal libraries in Europe."

Professor Henry was the well-known scientist who invented the electro magnet and who was then at the head of the Smithsonian Institution. Briefly, the principle referred to was that a train should not go on a "block" until notified that the block was clear, instead of proceeding unless a red signal was shown, as in former practice.

The statement in the report, to which reference is made in the foregoing letter, that the plan had been in operation "for a year past between Philadelphia and New Brunswick," doubtless indicates the time of completion between those points, after the experimental operation on a part of the line, in 1863.

In the report of the Interstate Commerce Commission, in 1907, on "Block Signal Systems," of which the technical portion was prepared by Messrs. B. B. Adams and C. C. Anthony, the following note appears:

"The first block signalling in America appears to have been on the line between Kensington (Philadelphia), Pa., and Trenton, N. J., in 1863 or 1864. This statement is based on the testimony of the late Robert Stewart, who was Superintendent of Telegraph of that road about that time. The space interval was adopted after the occurrence of a disastrous rear collision of east-bound trains at night carrying soldiers from the seat of war to New York and New England. The block system was extended north from Trenton to New Brunswick some time in 1864. The earliest date of which an authentic record has been found is November 12, 1869, which appears on a circular issued by F. Wolcott Jackson, General Superintendent of the New Jersey Railroad (Jersey City to New Brunswick), and dated at Jersey City, giving the rules under which the space interval was to be maintained. The circular is signed also by R. Stewart, Superintendent of Telegraph. The block system was put in effect from Frankford Junction westward to Mantua (West Philadelphia) in 1870. In 1872 the Pennsylvania Railroad took control of all these lines, and at that time a length of 90 miles was being worked by the block system. In a statement made by Mr. Ashbel Welch, in 1866, he speaks of the block system as having been in use for a year between Jersey City* and New Brunswick. The block signals consisted of banners in boxes, some of which have been in use until within a few years and may be familiar to the reader. The box stood on a post and red flannel banners were dropped in front of a white surface or white light for the stop indication. On some of the boxes there were hoods to prevent

*"Jersey City" should read "Philadelphia." In a letter of April 19, 1882, given in full farther on, Mr. Welch states that the system was extended to Jersey City in the spring of 1867, after the consolidation with the New Jersey Railroad, which occurred January 1, 1867.

impairment of the engineman's view by the rays of the sun reflected from the glass which covered the opening in the front of the box and protected the banner from the weather."

In 1876 the system was extended over the main line of the Pennsylvania Railroad Company, as appears from the report of the company for that year, which says: "The block system of signals was extended over the entire line between Philadelphia and Pittsburgh, and between Philadelphia and Jersey City, adding largely to the security and promptness with which trains were moved."

This, of course, was a valuable aid in moving the heavy traffic of the Centennial year.

After the preliminary installation in 1863, before mentioned, the system was formally authorized in the adoption of a paper, which describes the plan in such detail that it is worth while to reproduce the most of it here.

An endorsement states that it is the "First resolution adopted by the Ex. Com. March 27, 1865. R. S." The initials are those of Richard Stockton, Secretary of the Executive Committee. The paper is as follows:

"Ordered that a system of telegraphic safety signals be established between Kensington and New Brunswick by which a train passing one of the signal stations shall be informed whether the preceding train going in the same direction has passed the next signal station and whether the track is clear.

"The signal stations, except temporarily between Trenton and Dean's Pond, to be not over six miles apart, at points as far as practicable where there is a good view each way. Each provided with simple telegraphic and all other necessary apparatus. An independent wire to extend from each station to the next, with an independent instrument. An attendant to be always on duty night and day and at meal times.

"The safety signal will be a white polished reflector two feet in diameter with a light in front at night, seen through an opening of the same diameter in a box projecting over the platform from the upper part of the signal station building. The signal for northbound trains will be seen through an opening on the southerly side of the signal box; that for southbound trains through an opening through the northerly side. The two signals will be separated by a vertical partition. The box and partition to be painted black. The openings to be covered with glass.

"Each signal will be placed at the outer end of a horizontal lever the inner end of which will project within the signal office. From the inner end will be suspended a vertical rod by which it will be worked. The relative weights of the signal and vertical rod will be such that on letting go the rod the signal will drop out of sight to the bottom of the signal box below the opening. A horizontal screen will be attached to the top of the signal so that when down the light cannot shine on the partition and be reflected through the opening.

"The signal must be exhibited by pulling down the vertical rod with the hand. It must then be held by the hand as long as necessary and never under any circumstances made fast or held down by other means.

"Holes in the vertical rod will be made to match holes in a permanent post when the signal is dropped out of sight. When a train passes on one track or notice is received that a track is obstructed short of the next station, a peg will be instantly inserted in the hole through the rod working the signal belonging to that track, pinning it fast to the permanent post. Should another train pass or another obstruction be reported on the same track another will be inserted in another hole and so on. On receiving notice that a train has passed the next station or that an obstruction has been removed, the peg put in on acount of it will be instantly taken out and so on until the rod is left free. Thus there will be no mistake from forgetfulness or miscalculation.

"Whistling posts will be placed half a mile each way from each station, on arriving at which an approaching train will give a long loud whistle. On hearing this the signalman will exhibit the safety signal by pulling down the signal rod, provided it is free or, in other words, provided that all trains have passed the next station and all other reported obstructions are removed. The moment the train passes he will drop the signal and insert a peg in the rod. He will then listen to see whether the departing train keeps on its way. If so he will at the end of one minute after its passage report back to the next station that it has passed. If the train should stop at or within five hundred yards of the signal station the operator will report back the facts, but will not authorize the removal of the peg nor the exhibition of the safety signal at the next station back, but the next train must be stopped and informed of the facts.

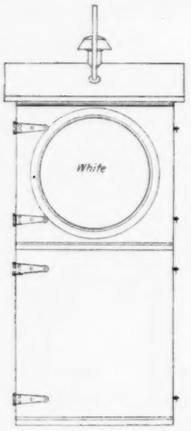
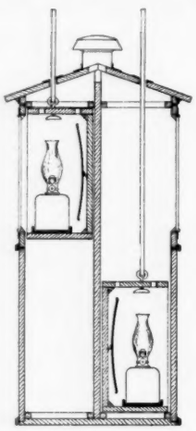
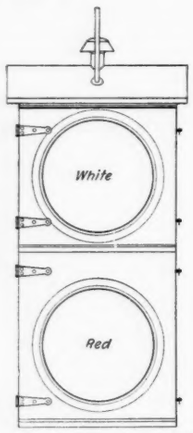


Fig. 1.





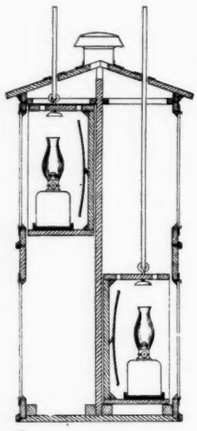
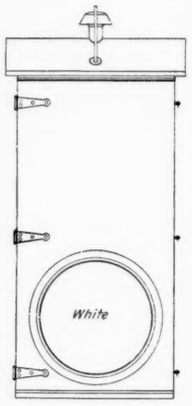


Fig. 2.



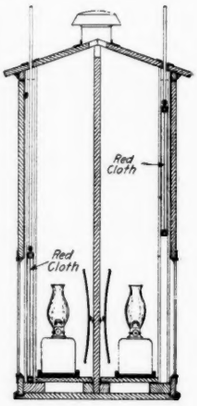


Fig. 3.

"Should a train stop within five hundred yards after passing a signal station the conductor must give notice to that station. Notice of passage if made must be countermanded, the peg representing that train left or reinserted, the next train stopped till the facts are explained, when it may proceed, taking care not to run into the delayed train. When fog or other causes prevents a signal from being seen the station will be approached cautiously so as to stop if necessary without running past.

"Regular trains will be designated by their number. Extras by description.

"When the safety signal is exhibited the engineer will give one puff of the whistle to notify the operator and conductor. When not exhibited he must whistle down brakes and stop. The train men must, of course, be on the alert. The signal man will then give the conductor all the information he possesses as to preceding trains not passed the next station or other obstruction. The conductor will then wait at least five minutes beyond the time the preceding train should have passed the next station unless the preceding train is at the next station or its position is known. He will then act according to instructions given from time to time to that par-

ticular train or class of trains. If pursuant to such instructions he goes on without the safety signal or without knowing where the preceding train is he must send a man ahead where he cannot see the track far enough to stop in time to ensure safety.

"The signal man will keep a card slip, for each track, ruled with three columns. In the first he will put down the number of every regular train or description of extra that passes on that track. In the second the exact time it passes. In the third the time that notice is given that it has passed the next station. These cards will be forwarded daily to the Superintendent's office where the motions of the trains will be plotted for inspection."

The paper contains several other paragraphs prescribing precautions which it is not necessary here to repeat. A copy has been preserved of the regulations issued in conformity with the above and dated Sept. 27, 1865.

References in this and an incomplete order preserved among Mr. Welch's papers, indicate the existence of previous rules, which no doubt were issued on the first partial installation.

The signal box, as originally designed, Fig. 1, showed a single opening. The white signal, for "safety," was movable, and when "safety" was not to be shown, the signal, with its light, was dropped below the opening, so that nothing appeared but the black partition on the box. Later, and perhaps before installation, this was so modified that when the signal with its light was dropped, a lower opening showed red (Fig. 2). Some other modifications ensued and, the final form, Fig. 3, showed a single opening and a fixed lamp. To indicate stop a red curtain was dropped before the lamp, and when the curtain was lifted "safety" was indicated. The whole arrangement was eventually superseded by the semaphore, with which, however, the principle was preserved.

On December 23, 1865, Mr. Welch made a long report, respecting his plan to the Committee of the Franklin Institute on Railroad Signals, in which he gives quite fully his views as to the importance of the principle he advocated, and describes other appliances which he had adopted, for security at switches and drawbridges. The paper enters into much detail respecting the construction of the apparatus and rules for operation, but its length precludes reproduction here.

From the letter of August 24, 1868, above quoted, it appears that at the time of devising the plan of "Safety Signals," its author had not heard of the English block system, and it seems that when he did hear of it he found it to differ radically in principle from his plan.

This is also set forth succinctly in the following letter, above referred to, dated April 19, 1882:

"I send herewith a reprint of a report which I made before the National R. R. Convention in 1866, on Safety Signals. The principles of the system now in use between Jersey City and Pittsburgh are set forth in it.

"I devised this system and put it in operation between New Brunswick and Philadelphia in the spring of 1865. After the consolidation with the N. J. R. R. I extended it to Jersey City in the spring of 1867. After the lease to the P. R. R. Co. in 1871, they extended it to Pittsburgh.

"When I put this system in operation, there was not as I believe anything like it in the world. The English Block System (of which I had never heard) was as then used, and used only in a few cases, unlike it in principle. That depended upon notice that something was wrong, without receiving which a train could go on.

"If from neglect of the operative, or failure to work of the apparatus, notice was not received, a train would go on supposing all was right and run into a delayed train. I was assured when in England in 1869, that such cases were not infrequent, and so, many railroad companies considered that the Block System increased the danger. My system instead of notice of a delayed train, required assurance that the track was clear. It is probable that now in England they have abandoned the old Block System, and that the system now so called and as now used may be the same as mine.

"But to call the system now in use between New York and Pittsburgh 'The Block System' conveys an entirely erroneous impression of its origin."

The date, 1865, in the foregoing, is that of the final authorized installation, between New Brunswick and Philadelphia.

It is stated authoritatively that the Block System was proposed in England as early as 1842, but that its introduction was very gradual. So far as has been ascertained, the use of the system there was quite limited at the time of Mr. Welch's visit to that country in 1854. This letter shows that he met with no example of it using the principle which he adopted, and the only case, mentioned in his notes, of the use of fixed signals, controlling the movements of trains, is one in which they were used simply for "spacing" trains by time intervals, which was, of course, not what is at present understood as a block system.

THE ADVANTAGES OF THE USE OF MODERATELY SUPERHEATED STEAM IN LOCOMOTIVE PRACTICE.

BY LAWFORD H. FRY.

With the growing use of superheated steam in locomotive practice a number of studies of the theoretical side of the question have been published. All of these, however, have been devoted to proving the value of very highly superheated steam, and have neglected to consider the economies which can be obtained by the use of a low degree of superheat. Recently, however, experience, with the Baldwin superheater in actual service, has shown that important advantages can be secured with steam having only from 50 to 100 degrees superheat. It is not proposed to study the theoretical side of the arrangement which gives such satisfactory results in practice. It will be shown that so far as coal consumption is concerned, a low degree of superheat offers practically the same opportunity for economy as does a very high degree of superheat. The conditions of operation are so much simpler with steam at a moderate temperature than with excessively superheated steam, that if the same economy, or even nearly the same economy, can be secured, the low degree of superheat is indicated as being the more desirable for ordinary conditions of service.

In studying the question it is necessary to take into account the operation of both boiler and engine. First let us consider the production of the steam by the boiler, and as a starting point take an ordinary locomotive boiler, having a ratio of grate area to heating surface of about 1 to 60, and a working pressure of 200 pounds per square inch above the atmosphere. Under normal conditions, with a rate of firing of 100 to 120 pounds of coal per square foot of grate area per hour, the boiler efficiency will be say 60 per cent., so that with coal of good quality, having a heating value of say 15,000 B.t.u. per pound, the boiler will take up and utilize for the production of the steam 9,000 B.t.u. per pound of coal fired. The heat above 60 degrees Fahrenheit in a pound of saturated steam at 200 pounds boiler pressure is 1,172 B.t.u., and consequently for each pound of coal fired, there will be produced $9,000 \div 1,172 = 7.68$ pounds of steam, the feed water being supplied at a temperature of 60 degrees. The temperature of the saturated steam at the boiler pressure of 200 pounds will be 388 degrees Fahrenheit. The products of combustion will leave the boiler tubes at some 260 degrees above this, say at 650 degrees, and their weight will be about 17.5 pounds per pound of coal actually burned, or say 13.5 pounds per pound of coal fired. At this rate (having a specific heat of 0.24) they carry off $13.5 \times 0.24 \times 650 = 2,100$ B.t.u., or 14 per cent. of the heat in the coal fired.

Now suppose that without any other change in the boiler, the working pressure be reduced to 140 pounds and a super-

heater be placed in the smoke box to utilize the heat of the waste gases to heat the steam to 400 degrees Fahrenheit, which is 40 degrees of superheat at the boiler pressure of 140 pounds. The tests made with the Baldwin superheater on the Rock Island Railway show that under these conditions the temperature of the smoke box gases will be lowered about 100 degrees so that they will now escape at say 550 degrees and thus carry off 13.5 x 0.24 x 550 = 1,780 B.t.u., or 11.9 per cent. of the heat in the coal fired. The superheater by reducing the temperature at which the smoke box gases escape, has increased the boiler efficiency from 60 to 62.1 per cent., and consequently the heat now utilized in the steam production is increased to .621 x 15,000 = 9,315 B.t.u. per pound of coal fired. Now each pound of steam at 140 pounds boiler pressure and a temperature of 400 degrees Fahrenheit has a volume of 3.1 cubic feet and has a total heat of 1,187 B.t.u. above 60 degrees. Therefore, with feed water at 60 degrees, each pound of coal fired will produce 7.83 pounds of steam and this steam will have a volume of 24.3 cubic feet.

Now examine the case of the same boiler modified to produce steam at 140 pounds boiler pressure with 290 degrees of super heat. The temperature of this steam will be 650 degrees Fahrenheit and it is obvious that the gases which heat this steam must leave the tubes at a considerably higher temperature. It seems necessary to count on a smoke box temperature of at least 800 degrees Fahrenheit, and at this temperature the heat carried off by the gases amounts to 13.5 x 0.24 x 800 = 2,590 B.t.u., or 17.3 per cent. of the heat of the coal fired. As compared with the original boiler, the efficiency has been reduced from 60 to 56.7 per cent., and the boiler now utilizes in the production of steam, only .567 x 15,000 = 8,510 B.t.u. per pound of coal fired. Now each pound of the highly superheated steam has a total heat of 1,317 B.t.u. above 60 degrees, and has a volume of 4.0 cubic feet, so that each pound of coal fired will produce 6.44 pounds of steam having a volume of 25.8 cubic feet.

The next point for consideration is the work which is done by the steam in its expansion in the cylinder. During the expansion the relation between the pressure and the volume can be represented by an equation of the form

$$p \times V^k = \text{constant.}$$

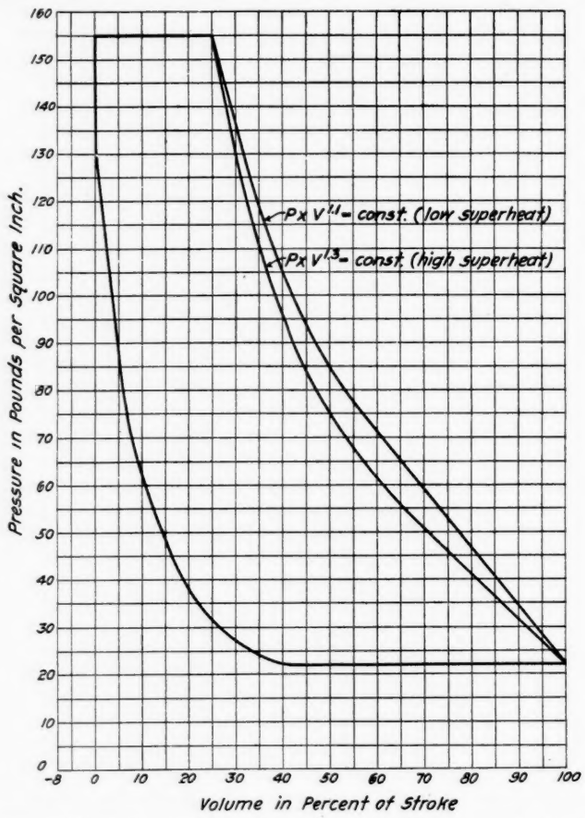
where p is the absolute pressure, V is the volume, and the value of the exponent k is determined by the state of the steam and by the conditions under which the expansion takes place. The lower the value of k, the slower is the decrease in the pressure and the greater is the work developed for a given ratio of expansion. With saturated steam, if the expansion takes place adiabatically, that is to say without the steam receiving or giving up any heat, the value of k is 1.135. In practice, however, the steam takes up heat from the cylinder walls and from the water produced by the initial condensation, and the pressure being thus maintained above that of adiabatic expansion, the exponent has the value 1.0, and the expansion follows the well known equation

$$p \times V = \text{constant.}$$

With superheated steam a similar process takes place. The adiabatic expansion of superheated steam would give the value of 1.333 to the exponent k, but in actual practice, though the initial condensation is very much less, yet the steam gives up some heat on entering the cylinder and takes a part of this heat again during the expansion. As a consequence, the pressure drops less rapidly, and the value of k is less than in the true adiabatic expansion. Wilhelm Schmidt, whose work in the use of highly superheated steam is well known, gave in the *Railroad Age Gazette* for July 17, 1908, the following values for k:

For a low degree of superheat $k = 1.1$
For a high degree of superheat $k = 1.25$

This means that the highly superheated steam shows a more rapid fall of pressure, and with the same initial pressure and ratio of expansion it develops less work than the steam with the low degree of superheat. We have now to study the application of these formulas to the expansion of the steam, of which the production has already received consideration. The ordinary conditions of operation are fairly represented by the cycle of expansion shown in the accompanying diagram, where the cylinder clearance is 8 per cent., cut off is at 25 per cent., exhaust at 60 per cent. of the stroke, while compression begins at 60 per cent. of the return stroke. The diagram shows the expansion, under these conditions, of slightly superheated steam with the exponent $k = 1.1$, and of slightly superheated steam with the exponent $k = 1.25$ for the expansion line. The saturated steam, which is not shown in the diagram, will expand with the exponent $k = 1.0$. It will be seen that the expansion line of the highly superheated steam lies below that of the slightly superheated steam, and the indicated work is found to be about 2.5 per cent. less for the same volume of steam. The saturated steam, being at 200 instead of 140 pounds



Comparative Expansion Diagrams for Slightly and Highly Superheated Steam.

boiler pressure, is not directly comparable on the accompanying diagram, but Mr. Schmidt has shown that at the same pressure and the same ratio of expansion the saturated steam gives about 7 per cent. higher indicated work than the highly superheated steam.

The diagrams plotted do not take into account the cylinder condensation, which is a matter for separate examination, but show simply the indicated steam. If the diagrams are laid down accurately to scale they can be measured with a planimeter, otherwise one can determine the indicater steam consumption by calculation. It is thus found that in passing through the cycle of expansion shown in the diagrams, from an initial pressure of 140 pounds to a back pressure of 7 pounds, each cubic foot of the low temperature steam develops 33,980 foot-pounds of indicated work, while the highly superheated steam develops only 33,150 foot-pounds. The saturated steam, with an initial pressure of 200 pounds, in passing through the same cycle of expansion develops 62,100 foot-

pounds of indicated work. The three classes of steam differ considerably in density, and if we compare them on the basis of weight we find that the indicated work per pound of steam is 105,000 foot-pounds for the low temperature steam, 132,300 foot-pounds for the high temperature steam, and 133,000 foot-pounds for the saturated steam.

Now to combine the engine and boiler efficiencies. With the low degree of superheat, each pound of coal fired produces 24.3 cu. ft. of steam, and is thus capable of developing 24.3 x 33,980 = 826,000 foot-pounds of indicated work, while with the highly superheated steam each pound of coal fired produces 25.76 cu. ft. of steam capable of developing 25.76 x 33,150 = 853,000 foot-pounds. With the saturated steam each pound of coal fired produces 16.5 cu. ft. of steam capable of developing 16.5 x 62,100 = 1,025,000 foot-pounds. Since one horse-power-hour is equivalent to 1,980,000 foot-pounds, the foregoing figures show that the indicated steam consumption for the three types of engines will be 18.9 pounds for the low temperature 15.0 pounds for the high temperature, and 14.9 pounds for the saturated steam per horse-power-hour. These are the steam consumptions shown by the indicator and are exclusive of the losses by cylinder condensation and leakage. In the saturated steam locomotive these losses are known to amount to 30 or 40 per cent. of the total steam consumption. If we assume for the present purpose, a loss of 37.5 per cent. the steam consumpton becomes 23.8 pounds per horse-power-hour, which is exactly the figure found by the Pennsylvania Railroad in its tests at St. Louis, for single expansion locomotives. [See page 704 of the report on the St. Louis tests.]

For locomotives operating with superheated steam the cylinder condensation has not been established directly, but it may be estimated by taking the difference between the actual steam consumption and the indicated steam consumption calculated above. It may be taken that as compared with the saturated steam engine, the low superheat will show a steam economy of 12.5 per cent., and the high temperature a steam economy of 30 per cent. This assumption, which is favorable to the high temperature steam, gives the following figures for the total steam consumption per horse-power-hour, for the low temperature 20.9 pounds, and for the high temperature 16.7 pounds. This agrees with the St. Louis results, which show a measured steam consumption of 16.6 pounds of high temperature steam per indicated horse-power-hour. On this basis we have for the low temperature superheat a steam consumption of 20.9 pounds actual and 18.9 pounds indicated, a difference of 9.5 per cent. for cylinder condensatiion and leakage, while the high superheat shows a consumption of 16.7 pounds actual and 15.0 pounds indicated, which is a difference of about 10 per cent. The figures thus obtained must be used with discretion, but they indicate that with superheated steam the cylinder condensation is not greatly affected by the degree of the superheat. As has been said above there are no direct measurements available in this connection, but the conclusion arrived at by the calculation seems to be justified by certain general conditions. It is probable that with saturated steam the greater part of the very large cylinder condensation is brought about by water which is carried into the cylinders with the steam. In locomotive practice the steam furnished to the cylinders usually carries from one and one-half to two per cent. of water, and it is extremely likely that the cylinder condensation, instead of being 30 or 40 per cent., would be cut down to a fraction of this if the steam were perfectly dry on entering the cylinders. If the steam is superheated, even though only slightly, although heat is lost on entering the cylinders, still the strong condensing effect of the water is completely suppressed.

To complete the investigation we have to determine the actual coal consumption, which is found from the foregoing figures to be 3.1 lbs. per horse-power-hour for the saturated steam, 2.67 pounds for the low temperature steam, and 2.60 pounds for the high temperature steam, which is only 2.6 per cent. in favor of the high as compared with the low temperature steam.

The accompanying tables enable the figures determined in the course of tne above calculations, together with some other figures of interest, to be compared.

Comparison of Saturated, and High and Low Temperature Superheated Steam.

Properties of the Steam:			
State	Saturated.	Superheated.	
Temperature in degrees Fahrenheit	388	400	650
Absolute pressure in lbs. per sq. in.	215	155	155
Degrees of superheat	0	39	289
Volume of 1 lb. in cu. ft.	2.14	3.10	4.00
Weight of 1 cu. ft. in lbs.	0.4675	0.322	0.250
Heat abv. 32 deg. F., in 1 lb. steam, B.t.u.	1,200	1,215	1,345
Heat required to produce 1 lb. steam from feed water at 60 degs. F.	1,172	1,187	1,317
Indicated work in ft.-lbs. developed by 1 lb. steam expanding in assumed diagram	133,000	106,000	132,300
Indicated work in ft.-lbs. developed by 1 cu. ft. steam expanding in assumed diagram	62,100	33,980	33,150
Properties of the Locomotive:			
Boiler efficiency in per cent.	60.0	62.1	56.7
Heat utilized by boiler in production of steam per lb. of coal fired, in B.t.u.	9,000	9,315	8,510
Lbs. steam produced from feed water at 60 degs. F. per lb. of coal fired	7.68	7.83	6.44
Cu. ft. steam produced from feed water at 60 deg. F., per lb. of coal fired	16.5	24.3	25.76
Indicated work in ft.-lbs. per lb. coal fired	1,025.000	826,000	853,000
Indicated consumption (no cylinder condensation) water per h.-p.-hr. in lbs.	14.9	18.9	15.0
Actual consumption with cylinder condensation, water per h.-p.-hr. in lbs.	23.8	20.9	16.7
Do., as per cent. of sat. steam	100.0	87.5	70.0
Cylinder cond. as per cent. of steam used.	37.5	9.5	9.5
Coal per h.-p.-hr. in lbs.	3.10	2.67	2.60
Do. as per cent. of sat. steam	100.0	86.0	84.0

HANDLING MERCHANDISE SHIPMENTS FROM CHICAGO TO THE SOUTH AND SOUTHEAST.

BY SAMUEL O. DUNN,
Western Editorial Manager, *Railroad Age Gazette.*

Co-operation between shippers and railways within the last three years has revolutionized the transportation of merchandise from Chicago to points in the South and Southeast. The Chicago Association of Commerce has used publicity to teach shippers how to ship, and to stimulate competition in service between the various roads. Its work along this line has proved of benefit in numerous ways to shippers, and, on the whole, has benefited the railways. And it has shown that intelligent, harmonious, honorable pursuit of their self-interest both by shippers and by railways will accomplish improvements in transportation service that never could be secured by recriminatory wranglings before railway commissions.

The movement of merchandise from Chicago to points in the South and Southeast formerly was subject to chronic delays. It was not unusual for goods to be in transit from 15 to 30 days. In addition, there was much loss and damage to shipments, owing to numerous transfers from car to car at junction points. Merchants in the South constantly were complaining that goods had not arrived when they were expected and needed. Jobbers at Chicago were constantly tracing their freight and bickering with the claim departments of the railways over loss and damage claims.

These conditions put the jobbers at Chicago at a serious disadvantage in competing against the wholesale merchants of New York, Philadelphia, Baltimore and other Atlantic seaboard cities for southern trade. Rates are lower from the Atlantic seaboard to most points in the South than they are from Chicago. The railways say that this is due to water competition. The business men of Chicago assert that it is due to unfair discrimination, and they are trying now to get the Interstate Commerce Commission to reduce the rates from Chicago. Whatever the cause of it the difference in rates exists. The jobbers and other business men at Atlantic seaboard points long have had close business relations with the South, and the movement of merchandise from the seaboard, both by boat and by rail, long has been large and quite expeditious and satisfactory. Under these conditions the jobbers of Chicago made

slow headway in building up business in the South. Their traveling salesmen in that territory long found it hard to earn their salt.

About three years ago J. F. Morton went to Chicago to lay before that city's jobbers a plan for getting better service to the South. Mr. Morton had been for twenty years in the employ of the Southern Railway. He had handled less-than-carload shipments at points along the line from Danville, Va., to Columbia, S. C., as transfer agent, and had been yardmaster at Danville. He had noted the delays and damage to merchandise moving to the South from the Central West, and had devoted much study to the causes and proper remedy. He had tried to get the officers of his road to adopt some more systematic method of handling L.C.L. shipments, but had failed to interest them.

As he could see that jobbers at Chicago were losing more by existing methods than any other concerns, he resigned his railway position, and on going to Chicago tried to organize its wholesale merchants in a bureau to systematize and expedite their L.C.L. shipments. He presented his plan to the Freight Traffic Committee of the Association of Commerce. The committee refused to adopt it because there was doubt as to its practicability, and the organization could not afford to father a project that might prove troublesome and expensive failure. But thirty-five jobbing houses finally decided to take up the scheme, with the understanding that the Association of Commerce would use its influence to get the railways to put on the through package cars necessary to give it a fair trial. The plan worked so successfully that in a year and a half the merchants who experimented with it recommended that the Association take it over, giving the assurance that they had found it was a good thing. The Association acted favorably on this recommendation.

In order to understand Mr. Morton's method and the results that have been secured by it, it is necessary to understand the causes of the conditions that existed before it was adopted. Formerly a shipment of merchandise from Chicago to Jacksonville, Fla., would be transferred from the car of one railway to the car of another at the Ohio river. It would be similarly transferred again at Nashville or Chattanooga and again at Birmingham or Atlanta, and again perhaps at Macon. These numerous transfers were made necessary by the fact that very few cars were run through from Chicago to points in the South; and so few package cars were run through because merchandise shipments were not so handled as to concentrate the shipments for a given point in cars that could be moved directly to that point. There were enough goods moving south to load many cars, and there were enough cars moving south to handle the goods, but the goods were not put in the right cars to make possible through transportation.

This caused the chronic delays mentioned. Transfers took an average of 48 hours each. If, therefore, three transfers were made six days were consumed that might otherwise have been used in transportation. These transfers were very expensive for the railways, costing directly from 20 cts. to 50 cts. per ton per transfer. They also caused much loss and damage to goods. Jobbers constantly were engaged in tracing their shipments, and railways constantly were engaged in settling claims.

Mr. Morton's remedy was the concentration of all shipments of merchandise from Chicago to any given point in the South in through cars that either reached that particular point or went nearer to it than any other available cars. His method was to induce the railways to put on through merchandise cars to the various distributing points, and then, by advertising these care extensively, to get as many shippers as possible to use them to the best advantage. The railways were found very willing to co-operate when assured of enough tonnage to warrant putting through cars into service. When Mr. Morton took up this work there were not over a half dozen through cars running to the South. The number has been steadily increased until the number of through routes is now about seventy-five. Generally a car is operated over each route daily, although over some routes cars are only run tri-weekly.

Shippers are induced by various means to do the necessary concentrating of their shipments. The Association of Commerce has from time to time issued a pamphlet entitled "Way to Ship," showing all through package car routes and telling in detail how to route shipments to obtain the best possible service. In addition a thorough system of tracing is used, so that it may be known just what time every car makes. Once a week Mr. Morton sends a postal card to the railway agent at the end of each through route. This card gives the initials and numbers of all of the cars that have left Chicago during the previous week over the particular route in question, and the agent is requested to fill out blanks stating the date and the hour on which each car arrived, when it was unloaded, and the reason for any failure to make schedule. A compilation of the results shown by these cards is printed every week in "Chicago Commerce," a weekly magazine issued by the Association of Commerce. In a good many cases different roads are running cars from Chicago to the same destinations. The results of operation over these competing routes being published weekly, shipper and railway officers can compare them, and the railways are constantly stimulated by publicity and competition to give the best service and make the best time practicable.

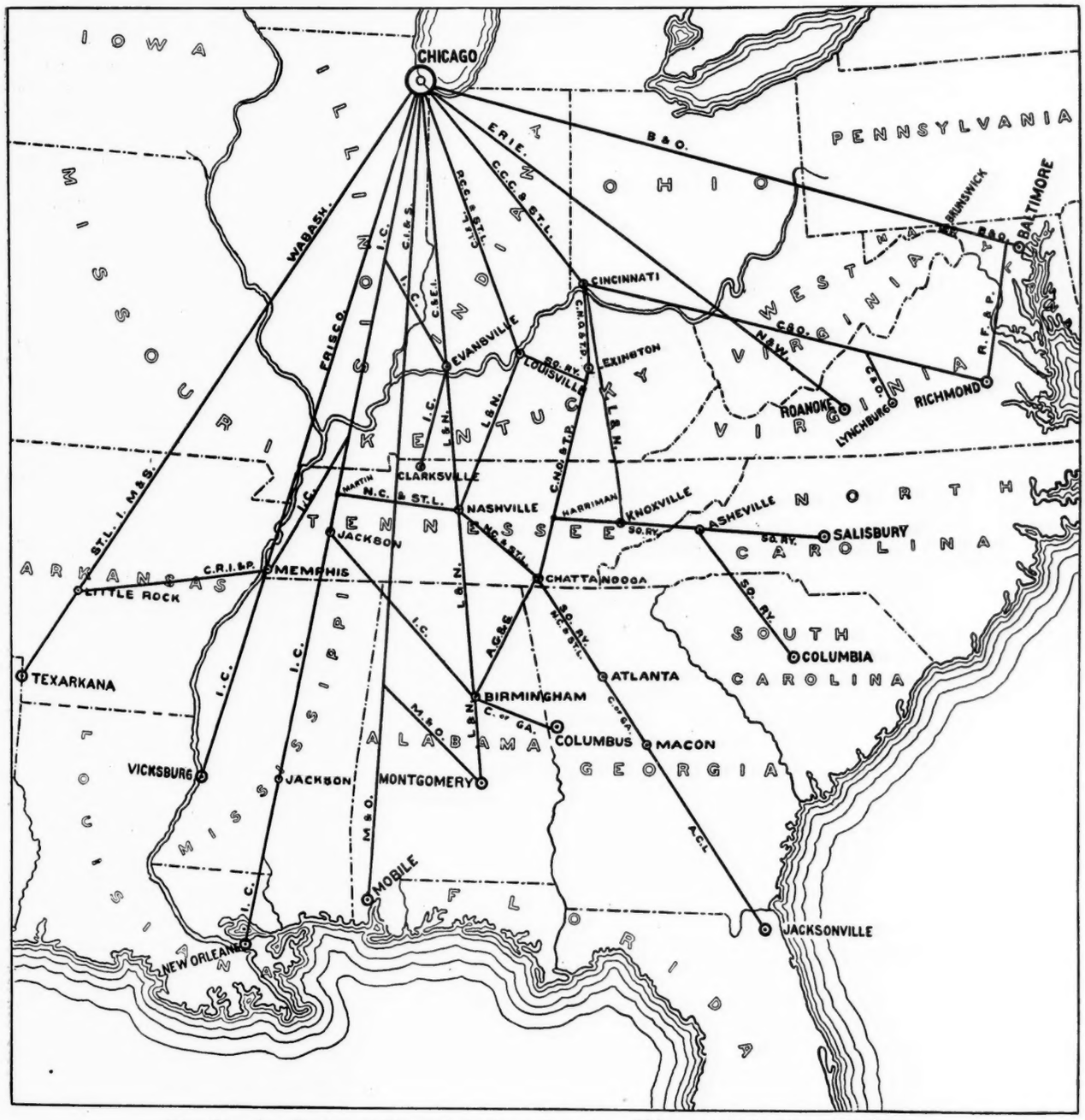
This arrangement has resulted in eliminating a very large number of the transfers from car to car formerly made. Through cars from Chicago now reach every important commercial center in the South and Southeast. In addition, the Association of Commerce has had the handling of freight beyond the destinations of the through cars carefully studied and advises shippers how best to route their shipments so as to have goods reach points beyond in the shortest time and best condition. Suppose, for example, that a jobber in Chicago has a shipment for Americus, Ga. By finding the name of this station in "Way to Ship" he learns that Americus is to be reached over route "05." This route is via the Chicago & Eastern Illinois, or the Illinois Central, care of the Central of Georgia, at Atlanta. From Atlanta the Central of Georgia runs a solid car daily to Americus, loaded with merchandise from all directions for that route. If merchandise from Chicago is loaded into one of these solid cars at Atlanta it will reach Americus in 4 days after leaving Chicago, and after being transferred but once, namely, at Atlanta. "Way to Ship" contains not only the routes of all through cars from Chicago to southern points, but also mentions all solid cars that are run from any of these distributing points to the smaller surrounding cities and towns.

Another method that has been used to save time is to so route shipments as to avoid switching. For example, a jobber wishes to send a shipment to a point in Arkansas. The Wabash and the St. Louis Southwestern use a joint station at St. Louis. Consequently, a through car from Chicago can be transferred from the tracks of the Wabash to the tracks of the St. Louis Southwestern at St. Louis with a minimum expenditure of time and money. Therefore, other things equal, the shipment should be routed via the Wabash and the Cotton Belt. Similarly, if goods are going to have to be transferred, they will, if possible, be routed to a transfer point where the road from which they are to be transferred has a joint station with the road to which they are to be transferred. Sometimes a rather roundabout route will be preferred to a more direct route because shipment via the more direct route may involve switching or transfer from one part of a city or town to another part, which may cause more expense and delay than shipment by the less direct route, but through joint terminals.

To learn what time it takes to get shipments to points that are not reached by through cars, shippers frequently send postal cards for their consignees to fill out with the date of

arrival of the shipments, these cards being returned to Mr. Morton. Thus the system of checking the movement of shipments is made practically complete.

The results of the use of this scheme have been various. It has greatly improved the transportation service secured by shippers. The keen competition between the railways which it has fostered not only has caused through routes to be established to every important distributing point in the South, but in numerous cases has caused several through routes to the same point to be established by different roads. The Illinois Central and the Nashville, Chattanooga & St. Louis are running a daily solid train from Chicago to Atlanta on a schedule of 50½ hours. Some time ago the Baltimore & Ohio was induced to put on a through car to Richmond, Va. It was doubted at that time if it would pay. The Baltimore & Ohio is now running cars three times a week and the Big Four and the Chesapeake & Ohio are also running through cars to Richmond. The movement of merchandise has been remarkably expedited. The average time consumed by shipments to the South has been reduced a week. Of course this reduction in time is a matter of great importance to the jobbers because it tends to reduce very materially the amount of capital that they have tied up in goods that are en route, and to enable them better to compete with their rivals on the Atlantic seaboard. It is estimated that the loss and damage to freight has been reduced at least 60 per cent. Whereas shippers formerly were engaged constantly in tracing their freight, there is now practically no tracing except to check up the time that is being made via the various routes. These improvements are enabling Chicago jobbers steadily to increase their sales to retail merchants in the South and Southeast.



Map Showing Routes of Through Package Cars from Chicago into Southern Territory.

they have to pay has been much reduced. But, as often happens, where conditions make competition between railways especially sharp, the results on the whole have been better for the shippers than for the railways. Through cars have been put on faster than the business to be handled has grown, and the lading per car ranges from 25,000 lbs. to below 6,000 lbs. Probably the average is not more than 8,000 lbs. Of course most of the merchandise handled is high class and pays a high rate, but, nevertheless, it is apparent that for the service rendered the revenue derived is not large. The shippers are by no means entirely, or perhaps even mainly, responsible for this. In most cases the cars have been put on at the solicitation of the Association of Commerce, and sometimes perhaps against the best judgment of railway officers. In some instances when cars have been put on against the judgment of railway officers they have paid surprisingly well. Once, for example, where a railway traffic executive put on experimentally a car that he confidently predicted would never pay, he was soon handling an average of 17,000 lbs. per trip, which, of course, was highly profitable. On the other hand, the railways, for competitive reasons, have in a good many instances put on cars when the Association of Commerce objected on the ground that the additional service contemplated would not pay and argued that it would be better for the railway to establish the service over a different route where it would have less competition. In some such cases the road, by establishing the competitive service, has got a profitable business, but not infrequently at the expense of some rival whose business had been rendered less profitable or unprofitable. There is no doubt however, that the cars usually pay; and perhaps as the system becomes perfected, the railways may see the wisdom of co-operating with each other a little better and not competing quite so severely. In that event the advantages to the railways may become as certain and as great as they are to the shippers.

Following is a list of stations to which through package cars are run daily from Chicago:

Asheville, N. C.—*Fourth Morning Delivery.*—For points on and via So. Ry., Hot Springs, N. C., to but not including Salisbury, N. C., and Columbia, S. C. Route C. I. & L. (Monon), to Louisville, Ky., So. Ry. to Danville, Ky., C., N. O. & T. P. to Harriman, Tenn., So. Ry. to Asheville, N. C.

Atlanta, Ga.—*Third Morning Delivery.*—1. For Atlanta and points beyond. Via C. & E. I. to Evansville, L. & N. to Nashville, N., C. & St. L. to Atlanta.
2. For Atlanta and points beyond. Via C., C., C. & St. L. (Big 4), to Cincinnati, C., N. O. & T. P. to Chattanooga, So. Ry. to Atlanta, Ga.
3. For Atlanta and points beyond. Via C., I. & L. (Monon) to Louisville, Southern Ry. to Danville, C., N. O. & T. P. to Chattanooga, So. Ry. to Atlanta.
4. For Atlanta and points beyond. Via I. C. to Martin, N., C. & St. L. to Atlanta.
5. For Atlanta and points beyond. Via P., C., C. & St. L. to Louisville, L. & N. to Nashville, N., C. & St. L. to Atlanta.
6. For points on and via Ga. Ry. exclusively. Via C. & E. I. to Evansville, L. & N. to Nashville, N., C. & St. L. to Atlanta.
7. For points on and via Ga. Ry. exclusively. Via I. C. to Martin, N., C. & St. L. to Atlanta.
8. For points on and via Central of Georgia exclusively. Via C. & E. I. to Evansville, N. & N. to Nashville, N., C. & St. Louis to Atlanta.
9. For points on and via Central of Georgia exclusively. Via I. C. to Martin, N., C. & St. L. to Atlanta.
10. For points on and via A., B. & A. exclusively. Via C. & E. I. to Evansville, L. & N. to Nashville, N., C. & St. L. to Atlanta.

Baltimore, Md.—For points on A. C. L., S. A. L. and Norfolk & Southern Ry.'s in the Carolinas. Via B. & O. to Baltimore, steamer from Baltimore to Norfolk, Va. Fourth morning delivery to connections at Norfolk, Va.

Birmingham, Ala.—*Third Morning Delivery.*—1. For Birmingham and points on the L. & N. south to but not including Montgomery, Ala. Via C. & E. I. to Evansville, L. & N. to Birmingham.
2. For Birmingham and points on the A. G. S. south of Birmingham, Via C., C., C. & St. L. (Big 4) to Cincinnati, C., N. O. & T. P. to Chattanooga, A. G. S. to Birmingham, Ala.
3. For Birmingham and points beyond. Via I. C. R. R.
4. For points on and via Central of Georgia exclusively. Via I. C.

Chaffee, Mo.—*Second Morning Delivery.*—For points on Frisco, south of Cape Gerardeau, Mo. Via C. & E. I. & Frisco.

Chattanooga, Tenn.—*Third Morning Delivery.*—1. For Chattanooga and points on Southern and A. G. S. Ry., south to but not including Atlanta and Birmingham. Via C., C., C. & St. L. (Big 4), to Cincinnati, C., N. O. & T. P. to Chattanooga.
2. For Chattanooga and points on Southern Ry. and A. G. S. Ry., south to but not including Atlanta and Birmingham. Via C., I. & L. (Monon) to Louisville, So. Ry. to Danville, C., N. O. & T. P. to Chattanooga.
3. For Chattanooga and points south on N. C. & St. L. Ry. Via I. C. to Martin, N., C. & St. L. to Chattanooga.

Cincinnati, Ohio.—*Second Morning Delivery.*—1. For Cincinnati and points beyond. Via C., C. & L.
2. For points on C., N. O. & T. P. exclusively. Via C., C. & L.
3. For Cincinnati and points beyond. Via C., C., C. & St. L. (Big 4).
4. For C. & O. Ry. points exclusively. Via C., C., C. & St. L. (Big 4).
5. For Cincinnati and points beyond. Via C., I. & L. (Monon).
6. For Cincinnati and points beyond. Via P., C., C. & St. L. (Pan Handle).

Clarksville, Tenn.—*Third Morning Delivery.*—For Clarksville and points on and via Tennessee Central. Via I. C. to Hopkinsville and Tennessee Central beyond.

Columbia, S. C.—*Fourth Morning Delivery.*—For Columbia and points on Southern Ry. and A. C. L. beyond Columbia. Via C., I. & L. (Monon) to Louisville, Southern Ry. to Columbia.

East St. Louis.—*First Day Delivery.*—1. For points on the Cott. Belt, M. & O., St. L., I. M. & S. Rys. Via C. & A.
2. For points on the M. & O. exclusively. Via C. & E. I.
3. For points on the Cott. Belt and M. & O. Rys. Via Wabash Ry.

Evansville, Ind.—1. For points on the L. & N. Ry. and L., H. & St. L., exclusively. Via I. C. Ry.
2. For points on the L. & N. and L., H. & St. L. exclusively. Via C. & E. I. Ry.
3. For points on and via I. C. R. R., exclusively. Via I. C. Ry.

Jackson, Miss.—*Third Morning Delivery.*—For Jackson and points on I. C. south of Jackson and all points on G. & S. I. Via I. C.

Jackson, Tenn.—*Second Morning Delivery.*—For Jackson and points on I. C. R.R. between Jackson, Tenn., and Water Valley, Miss. Via I. C. R.R.

Jacksonville, Fla.—*Fifth Morning Delivery.*—For Jacksonville and beyond. Via I. C. to Martin, N., C. & St. L. to Atlanta, Central of Georgia to Albany, A. C. L. to Jacksonville, Fla.

Knoxville, Tenn.—*Third Morning Delivery.*—1. Knoxville and points on and via L. & N. R.R. south of Knoxville. Via Big Four to Cincinnati, L. & N. to Knoxville.
2. For Knoxville and points on and via Southern Ry. in Tennessee. Via C., I. & L. (Monon) to Louisville, Southern Ry. to Knoxville.
3. For Knoxville and points on and via Southern Ry. in Tennessee. Via P., C., C. & St. L. to Louisville, Southern Ry. to Knoxville.

Lexington, Ky.—*Second Morning Delivery.*—For Lexington and points on C., N. O. & T. P. and L. & E. Ry., south of Lexington. Via P., C., C. & St. L. to Cincinnati, C., N. O. & T. P. to Lexington, Ky.

Little Rock, Ark.—*Third Morning Delivery.*—1. For Little Rock and beyond for points on C., R. I. & P. in Arkansas and Louisiana. Via C. & E. I. to Memphis, C., R. I. & P. to Little Rock.
2. For Little Rock and beyond for points on C., R. I. & P. in Arkansas and Louisiana. Via I. C. to Memphis, C., R. I. & P. to Little Rock.
3. For Little Rock and points on St. L., I. M. & S. beyond Little Rock. Via Wabash to East St. Louis, St. L., I. M. & S. to Little Rock.

Louisville, Ky.—*Second Morning Delivery.*—1. For Louisville and points beyond. Via. C., C., C. & St. L. (Big Four).
2. For Louisville and points beyond. Via C., I. & L. (Monon).
3. For Southern Ry. points, exclusively. Via C., I. & L. (Monon).
4. For L. & N. Ry. points exclusively. Via C., I. & L. (Monon).
5. For Louisville and points beyond Via P., C., C. & St. L. (Pan Handle).

Lynchburg, Va.—*Fourth Morning Delivery.*—For Lynchburg and points beyond. Via C., C., C. & St. L. (Big Four) to Cincinnati, C. & O. to Lynchburg.

Memphis, Tenn.—1. For Memphis and points on Frisco, Memphis to Birmingham. Via C. & E. I. R. R.

Third Morning Delivery.—2. For Memphis and points on the I., C. & Y. M. R. R. south to but not including Vicksburg and Jackson, Miss. Via I. C. R. R. Second Morning Delivery.

Mobile, Ala.—*Fourth Morning Delivery.*—For Mobile and points beyond. Via C., I. & S. (No. & So. Dispatch) to Cairo, M. & O. to Mobile.

Monette, Mo.—*Second Morning Delivery.*—For points on Frisco south of Monette. Via C. & E. I. and Frisco.

Montgomery, Ala.—*Third Morning Delivery.*—1. For points on and via A. C. L. exclusively. Via C. & E. I. to Evansville, L. & N. to Montgomery.
2. For Montgomery and points on and via L. & N. south of Montgomery. Via C. & E. I. to Evansville, L. & N. to Montgomery.
3. For Montgomery and points beyond. Via C., I. & S. (No. & So. Dispatch) to Cairo, M. & O. to Montgomery.

Mounds.—*Second Morning Delivery.*—For points on and via I. C. and N. C. & St. L., Hickman, Ky., to but not including Nashville, Tenn. Via I. C. R. R.

Nashville, Tenn.—*Second Morning Delivery.*—1. For Nashville and points on L. &. N. south to but not including Birmingham. Via C. & E. I. to Evansville, L. & N. to Nashville.
2. *Second Morning Delivery.*—For points on and via N., C. & St. L., exclusively. Route C. & E. I. to Evansville, L. & N. to Nashville.
3. For Nashville, and points on N., C. & St. L., Nashville to Chattanooga. Via I. C. to Martin, N., C. & St. L. to Nashville. Second Morning Delivery.
4. For Nashville and points on L. & N. south to but not including Birmingham. Via P., C. C. & St. L. to Louisville, L. & N. to Nashville. Second Morning Delivery.

New Orleans, La.—*Fourth Morning Delivery.*—1. For New Orleans. Via C., I. & S. (No. & So. Dispatch) to Cairo, M. & O. to Meridian, N. O. & N. E. to New Orleans.
2. *Third Morning Delivery.*—For New Orleans. Via I. C. R.R.
3. For points on and via Southern Pacific in Louisiana, exclusively. Route I. C. to New Orleans.

Richmond, Va.—*Fourth Morning Delivery.*—1. For Richmond and points beyond. Via B. & O. to Washington, R., F. & P. to Richmond.
2. *Fifth Morning Delivery.*—For Richmond and points beyond. Via C., C., C. & St. L. (Big Four) to Cincinnati, C. & O. to Richmond.

Roanoke, Va.—*Fourth Morning Delivery.*—For Roanoke and points beyond. Via Erie to Columbus, N. & W. to Roanoke.

Paducah, Ky.—*Second Morning Delivery.*—For points on I. C. in Kentucky, and N., C. & St. L. Paducah to Memphis. Via I. C. R.R.

Salisbury, *N. C.*—*Fourth Morning Delivery.*—For Salisbury and points beyond. Via C., I. & L. (Monon) to Louisville, Southern Ry. to Salisbury.

Texarkana, Ark.—*Fourth Morning Delivery.*—For Texarkana and points beyond on T. & P. R.R. in Louisiana. Via Wabash to East St. Louis, St. L., I. M. & S. to Texarkana.

Vicksburg, Miss.—*Fourth Morning Delivery.*—For Vicksburg and points on Y. M. V. R.R. south to but not including New Orleans. Via I. C. R.R.

LOCAL FREIGHT OFFICE EFFICIENCY, FROM THE VIEWPOINT OF THE GENERAL FREIGHT OFFICE.

BY CHARLES R. FRENCH.

The local freight office in the smaller towns and cities of this country is usually an isolated, desolate, uninviting building, with not more than half enough room and light for its occupants and their work, or the paraphernalia incident and necessary to their daily task; the idea apparently being that anything is good enough for the freight agent and his help. And yet you will usually find the occupants of these offices cheerful, keen, intelligent men, alive to all the needs of the business.

Through freight, express, mail and passenger business count for a great deal, in the yearly revenue received totals, but opposite to them the expense of maintaining them foots up to an amount equal or practically so, hence they must be considered the "trimmings," necessary, but not the bread-winners.

The local freight business is the mainstay, the bread-winner, the dividend payer, of any line and the local agent, in proportion to his alertness, ability and friendliness to the shipping public, is the best revenue producer of the railroad. When a local movement for new industries starts, who is more welcome at the council of citizens called to consider the project than the popular local agent? And, indeed, who can better help than he? But, be he grumpy, unfriendly, unpopular, he cannot keep in touch with this local spirit and much of benefit to the town, the railway and himself is lost. Whatever makes for the benefit of the town itself reflects on the revenues of the station and to the credit of the agent.

By the use of a little diplomacy, shrewdness and common sense, an agent may become a leader, or at least a factor, in local enterprise, on whom the business people will rely; this may be accomplished by quietly exercising his influence for additional business enterprises, pointing out the advantages to capital and to the town, the increase of labor, with its attendant increase in population, need of more buildings, larger and better stores, larger bank accounts, higher prices for real estate, etc.; by consistently helping the business men of his community to new and larger markets, obtaining and giving them bits of information for their benefit; by striving to better the service he is able to offer them, both to and from his station; and last, but by no means least, by everlasting keeping before his superior officers the possibilities, probabilities and actualities of his station. He should not ask of his superiors impossible or unnecessary things, but only for what he knows his station needs to handle the business in sight, and he should keep after these things until he gets them.

Above all things, the local agent needs to keep his head and his temper, or, if he can, cut out the latter and send it to his worst enemy.

Just why the railways have so long neglected the local station, from which their best revenue is derived, is hard to understand; but it has been next to impossible to get proper accommodations, improvements, enlargments for sidings, platforms and warehouses, capable men in sufficient quantities, or enough pay to keep them when secured; anything seemed good enough for the local office; everything being sacrificed to the insatiable goddess Speed.

But one explanation presents itself for this condition and that is that the superintendent (under whose direct charge the agent is placed) is generally promoted from the Maintenance of Way Department, where naturally the radii of curves, strength of bridges, grades, condition of track and roadbed and kindred subjects were his daily diversion—in fact, he has been educated as a civil engineer and has practiced engineering in its application to railroading for years—and as that department is kept reasonably busy attending to its own work, he has not had the time nor the opportunity to familiarize himself with the work and needs of the freight department; consequently, when matters of importance to the proper development of the local station are brought to his attention he is apt to look at them from the standpoint of efficiency as it is regarded by the department in which he was educated, thereby missing the vital necessity for the improvement and turning it down.

To illustrate: The agent at a point in the middle west reported to his superintendent that a triangular tract of land adjoining the freight station property was to be vacated by a manufacturing concern and that the property had been offered the railroad. The agent recommended its purchase for a team track yard and freight warehouse. The facilities for handling the passenger and freight business were inadequate and would soon seriously cramp the space then occupied. Expansion was impossible, except in the direction indicated. The force of the suggestion was so obvious that the mere fact of calling it to the attention of the superintendent should have been sufficient, but he rejected it quite brusquely. The town had increased in population and business about 126 per cent. in ten years and was showing a vigorous growth at the time. Some months later, the general manager happened along and, being a man who saw things, noticed the vacant property and, appreciating its value and the need of better facilities at the station, asked why the attention of the proper officials had not been called to it. He was invited to look at certain correspondence on file in the agent's office, which resulted in his ordering the property secured at once. In the meantime two other parties were after the property, and the result was that it cost the railway over twice the original amount asked. You may say it was directly in line with the superintendent's supposed duty to know the conditions and requirements of this station. While in a broad interpretation of his duty this may be true, he could not fully appreciate the actual freight conditions as could a freight department man.

Do not understand from this that any criticism of the superintendent is meant. On the contrary, he is generally an efficient, painstaking man, but from the very nature of his training cannot understand or appreciate the working and need of the local office from the viewpoint of the freight department, which is the very heart of the whole organism of railroading; the maintenance of way department may point with pride to its magnificent roadbed, bridges, block signals, etc.; the passenger department may boast of its superb accommodations for the traveling public, or its "personally conducted tours," but the steady-going, hard-working freight department, with none of the red fire, blare of trumpets or press agents, quietly, but none the less surely, foots the bills, makes up the deficits created by the other departments and pays the dividends.

And what does this department, which is the chief revenue producer, do for the men upon whom it depends for the showing it must make in the annual report? Very, very little, the writer is sorry to say. Occasionally it sends him a tariff and quite frequently circulars or various kinds, but does it ever concern itself to find out whether these tariffs and circulars are understood by the recipient? Do the heads of this department know personally any of the agents? To both the above questions the answer is "No." Do the superintendents know the agents personally? Yes, every one. And so do the officers of the various other departments, but the agent is not in touch with his general freight office and, as far as that office is concerned, he (the agent) is left pretty much to his own initiative as to how he shall conduct his station. His general freight department corresponds with him, but that does not constitute supervision. It is merely asking for some bit of information or a criticism of something or other, with little or no effort to help him correct it. The agent has no personal acquaintance with the men of the general freight office with whom he corresponds, but has formed his own opinion of them from their correspondence, as they have of him from his, and both are probably very much wrong in their deductions. The

agent has, therefore, a very far from correct appreciation of his general freight office and is very likely misunderstood through their size-up of him, consequently there is a lack of sympathy or co-operation between them.

The general or division freight agent will tell you he has not the time to devote to the proper supervision of the agent, which is true—for he is a member of numberless associations and committees, which keep him pretty busy looking after the duties imposed by them, all of which are essential—yet neither has he the time to give the proper supervision to his office, but the work is done, and done well, because he has a competent man as his chief clerk to look after that for him in his absence. The general freight office should keep in close relationship with the agent, and the only way to do so is to have a personal representative who is acquainted with both.

The operating department has several assistant trainmasters, whose sole duties are to look after the men under the direction of their department, keeping in daily touch with them and bringing them into close relationship with the department.

The motive power department has road foremen in close touch with its engineers and firemen.

The maintenance of way department has its supervisors, who go over their divisions daily, advising, instructing, listening to suggestions from their sectionmen.

The division operator is required to make frequent trips over his division to thoroughly familiarize himself with the conditions along the line and to become acquainted with the operators under him.

Does it not seem that the freight department is making a grave error in not adopting a similar plan? A man, appointed by the general freight department and reporting to the general or division freight office, for each division, whose duty it would be to keep in touch with the agents and between them and the general freight office—who would spend enough time with each agent to become thoughly acquainted with him; who would be able to answer all questions asked, or, if he could not answer them, get the information on his next visit to the general office; whose sympathies were with the agent, who could understand him—would appear to be an invaluable addition to the staff of the general freight office. He should be a man educated in the freight service, preferably an agent, one who has been through the grind and able to enter into and appreciate the feelings of the agent.

In the course of the writer's experience he has visited many local offices and has had the opportunity of noting the ideas of many agents, resulting in the evolution of a system of administration which, subject to the necessary modifications to fit it to any particular station, may be of some assistance.

In the first place, the agent should inoculate his clerks with the idea that their own brains were made to use—that suggestions they may have for the improvement of the work will be carefully considered; invite their criticisms of existing methods; get their co-operation—and before he is aware of it there will have been a marked improvement in the way the work is turned out. Changes must come gradually, to avoid confusion—perhaps several methods will have to be tried before the best one is decided on. Aim to secure the simplest method consistent with thoroughness, so that any information desired may easily and quickly be found.

Perhaps at no other place is the parsimony of railways toward the local freight station so well shown as in its attention to track and warehouse facilities. This is in part due to the rapid growth of most stations beyond their facilities, but when improvements are made existing conditions only are considered and no provision made for future expansion; result—by the time the improvements are completed the business has outgrown them and the ingenuity of the agent taxed to the utmost to provide a semblance of accommodation for his patrons.

Little can be said of any benefit of the use of tracks in the yard. At each station the conditions differ and the agent and yardmen can, by a little study, devise a plan which will relieve pressure and give a maximum of utility. The hearty co-operation of every man under his command is essential to the success of any agent, and this can be easily secured if the clerks and other employees are made to understand that the good of the agency is their good, the success of the agent is their success.

The warehouse track or tracks should, as far as possible, be used for the loading and unloading of L.C.L. shipments. If possible, a track should be set aside for all cars containing shipments in excess of 10,000 pounds, so that consignees may go direct to the car and unload, without dragging such shipments through the warehouse.

The seal record of all cars received should be carefully taken and kept in a book provided for that purpose.

In checking out the contents of merchandise cars, check should be taken from the original waybill wherever possible, and any and all discrepancies noted thereon. The practice in some localities of "blind checking" is laborious, unnecessary and conducive of error. Why waste the time to check out the freight, entering the various items into a book and then checking the book entries against the waybill? For a permanent record? Will not the waybill afford such permanent record in much better shape? And can not the time wasted in this duplicate work be much better employed elsewhere?

Auditors of some railways require waybills to be sent to them when the agent has finished with them. The writer cannot conceive of any good reason for this practice, if the auditor has received, as he should, tissue copies of them. There are so many after-complications constantly arising, which make reference to the original waybill absolutely necessary, and as the waybills are part and parcel of the permanent records of the station, that in the writer's opinion an agent would be justified in refusing to part with them under any pretext whatever.

At one station all waybills, as soon as received, were placed in the hands of the car clerk and by him held until the receipt of the car, when they were stamped with a rubber stamp reading:

Car Received.....
Train No. ..... Time.....
Placed .....
Contents checked by.....
Seals .....
Entered F. R. Book P.....
Extensions checked by .....

and date, train number and time noted by him. Time placed for unloading, check and seals were noted by check clerk, and freight received book page and check on extensions entered by freight received clerk.

At this station the night clerk made out expense bills for all waybills received during the night, attaching same to the waybills. This was done to gain time in the morning, when consignees came to receive their freight.

The car clerk, upon receipt of a car, after noting the time, date and train number as above, turned the waybills over to the check clerk, and the express bills to the cashier. Waybills received during the day, provided the cars were also received, went first to the cashier's department to have expense bills made, and then to the check clerk.

The practice in some localities of having the check clerk hold "over" and "short" reports for several days is a bad one and liable to lead to confusion and expense. All discrepancies should be promptly reported by the check clerk to the proper clerk in charge of "over," "short" and "damage" reports, that prompt action may be taken by him.

When freight has been checked out of car the next consideration is its proper disposition in the warehouse, where it will be easily found and easy of access. The writer has seen several systems of warehouse storage, and he believes that of these the two following will be found to be the best, his preference being for the first:

At station "A" the warehouse was divided into sections of

suitable size, marked "A," "B," "C," etc., each section being plainly marked with its space letter. An alphabetical list of consignees was made up and each consignee assigned to a space, the space assigned him being marked opposite his name on the list. All freight received for any particular consignee was placed in the space assigned him and he soon became accustomed to look in that place, and did not have to run all about the warehouse, picking up a box here, there and anywhere, as at some stations. Lists were posted in the warehouse for the use of stevedores, truckmen and others interested.

At station "B" the warehouse was divided into sections, the same as at "A," but instead of the sections being lettered each had the name or names of consignees to whom the space had been assigned prominently displayed above it. The method of stowing freight was the same in both cases.

So far as possible, the warehouse should be used only for inbound freight and the platform for outbound. When shipments are delivered from the warehouse a check should be taken, whether the shipment checked out of the car without exception, or not, to forestall any claim of consignees for alleged shortage or damage and to protect the railroad company against errors of delivery. Agents should not hesitate to note on the expense bill any discrepancy in the shipment (as is provided in their books of rules), and they should also make report of such discrepancies to their general office, making such explanatory remarks as may be necessary.

A great many errors are caused by careless or improper supervision of loading and by stevedores loading a part of a shipment in the wrong car. To overcome this and lessen the chance of making errors, a number of systems have been tried with more or less success. Of these perhaps the best is the "ballot system."

Under this system the cars are numbered "1," "2," "3," etc., beginning with the car first in or the car first out. Car No. 1 is always in the same place, day after day, so that the stevedores when told to take a shipment into car No. 1 know instantly where that car is located. The destination of the cars may be changed daily by the check clerk, but he alone concerns himself with the destination, the stevedores concerning themselves only with the number. A small, square block of wood, with a screw-eye on one end, will answer the purpose of marking. The block may be painted white, with the number in black, and may be hung on the car door during the time the cars are being loaded.

The check clerk, in making up his list of cars for the day, or half day, should take the numbers of the cars in the order in which he will number them, thus:

1. C., M. & St. P... 77773 Chicago, local.
2. C., B. & Q. .... 11006 Chicago, through
3. C. A. & C. ..... 10163 Columbus.
4. C., N. O. & T. P. 90640 Cincinnati.
5. M. C..... 4030 Toledo

making his list on a card, which he can carry with him for reference. As he checks the shipments for the various cars he should note on the shipping order each stevedore's name and his load, as:

Dan, 2 boxes.
Jack, 1 bbl.

In each car is placed a small box—a cigar box will answer nicely—containing check or ballots of cardboard or other suitable material, bearing the number of the car as denoted by the block. In car No. 1 the box will contain ballots numbered "1," car No. 2 ballots numbered "2," etc. When the stevedore deposits his truckload into the car, as directed by the check clerk, he takes a ballot from the box, which he hands to the check clerk upon his return. If the ballot corresponds with the number of the car to which he was directed his load is checked off and he is given another load. If the ballot is not correct the check clerk immediately goes with the stevedore to the car into which he deposited the load and has it properly loaded, marking up an error against the stevedore. This method will not cause undue delay in loading, and if the records of each stevedore are posted once a month it will engender a close rivalry among them to keep their records clear.

Should the ballot system be found unsuited to a station, a more simple, but less effective, method is that of placing signboards on the car doors, these boards showing the points for which freight is being loaded into the cars bearing them.

(To be continued.)

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

XVI.

If any electrification scheme be proceeded with, the railway department will have available a supply of electrical energy at a low price, and I certainly consider that it would pay to equip the Newport workshops and the North Melbourne workshops for electrical driving. I have prepared a complete scheme for this, which is submitted with this report.

The following is a summary of my recommendations:

1. That three-phase induction motors be used throughout.

2. That a voltage of 400 to 440 volts be adopted for power distribution purposes throughout the works.

3. That the energy be obtained from the Yarraville power station and transmitted to Newport by an overhead line at the generated pressure, to be transformed at Newport down to 440 volts, by means of two 750 kw. stationary transformers.

4. That if it be decided to proceed eventually with the electrification of the Williamstown branch, these transformers be situated in a sub-station close to the railway which will ultimately be used also for the purposes of the railway.

5. That the sizes of motors adopted throughout the workshops be standardized as to both horse power and speed.

6. That the North Melbourne workshops be converted to electrical driving on the same system, the energy in this case being obtained from stationary transformers installed in North Melbourne sub-station.

The whole installation involves some 980 b.h.p. in motors and the estimated capital cost is £9,550.

The cables and sub-station plant necessary for delivering this energy to the points required do not really form part of the railway scheme, and the accompanying table therefore gives separately my estimate of the cost of providing a supply in bulk to the Spencer Street lighting station, the St. Kilda Tramway, for general lighting purposes and for the Newport and North Melbourne workshops. It does not deal

Capital Cost of Cables and Sub-station Equipment for Power and Lighting Scheme.

	Sub-station equipment.	High-tension mains.	Est. cost including connections
Spencer St. Lighting Station.	2 500-kw. frequency converters in existing building.	12,000-volt cable connection at Spencer St. 2,000-volt cable to Richmond and No. Melbourne.	£10,254
St. Kilda Tramway Power Station.	*2 200-kw. rotary converters, one in Brighton Beach, and one in Balaclava sub-stations.	†None.	2,795
General Station Ltg. Scheme.	Supplied from conductor rail.	None	.....
Newport Workshops.	2 750-kw. stationary transformers.	Overhead line from Yarraville.	5,661
No. Melbourne Workshops.	1 100-kw. stationary transformer in North Melbourne sub-station.	None	654
Total			£19,364

*These sets will each be capable of dealing with overloads up to 400-kw.

†An expenditure of approximately £7,273 for mains would be incurred if this work were put in hand before Stage I.

*Abstract from the Report to the Victorian Railways Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

with the cost of the actual equipment of the Newport shops themselves or the wiring of the passenger stations, these matters being separately dealt with.

The next table shows the total consumption of electrical energy and the estimated maximum demand for power and lighting. In preparing this table, I assume that at Stage I practically all the work will be complete with the exception of that portion of the station lighting included only in Stages II and III, and that thereafter it will gradually increase, due to the extended use of electricity for power and lighting purposes by the railways.

In designing the power station at Yarraville, allowance has been made for this load, and in the estimates of power costs (*Railroad Age Gazette, January* 8.) I have allowed for the cost of generating this additional energy. It is desirable, however, in order that careful costs and records may be kept, that the amount of electrical energy so used be recorded separately, and I have allowed for meters being erected on the low tension

Total Energy Consumption for Power and Lighting Scheme.

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
Output at power station*	3,922,400	5,070,450	6,440,110	7,793,490
Consumption at meters.*	3,137,920	3,929,600	4,830,080	5,845,120
Cost to power & lighting scheme.†	£9,806	£12,280	£15,094	£18,266
Maximum demand in kw.‡	1,449	1,636	2,081	2,585
Maximum demand in e. h. p.	1,943	2,193	2,790	3,466

*In units, per annum.
†At ¾*d.* per unit.
‡Allowing for diversity.

side at the different points where current is required. As already mentioned, I suggest that the electric energy should be charged out at the supply meters at an average rate of ¾d. per unit (kilowatt-hour).* The table also shows the amount chargeable to power and lighting at the different stages on this assumption. In a later table, therefore, which will give my estimates of the cost of power debitable to traction, I assume that this will be done, and have deducted from the total generating costs given in the table of estimates of power costs, referred to above, the cost of the electrical energy used for power and lighting at ¾d. per unit.

If we wish to make a fair comparison between electric traction and the alternative of continuing to operate the suburban system with steam traction, we must also include an estimate of the additional capital expenditure and operating expenses which would be necessary to enable steam traction to cope with the increased traffic in 1912. There will obviously be some addition to the present figures as regards both capital expenditure and operating expenses, as these are the figures for the present traffic and would not cover the increased traffic which we may look for in 1912. (See chart, *Railroad Age Gazette*, Nov. 20, 1908.)

This raises the question as to what traffic we are to base these steam figures on, for, of course, as one of the advantages claimed for electric traction is an increase of traffic, it would not be fair to debit steam traction with the cost of carrying the same traffic as we have assumed for electric traction unless we credit it with the same revenue. I therefore base the costs of steam traction on a traffic only 20 per cent. greater than the 1906 figures, as against 25 per cent., the increase assumed with electric traction. The service to be given is assumed to be the present service, strengthened where necessary to deal with the greater traffic, and no allowance has been made for any large increase in the number of trains throughout the day, as in the case of the electric service. The figures which I give are those prepared after our discussion in Melbourne on this subject with the general passenger and freight agent; these figures have already received approval.

*It would be a matter for departmental arrangement as to whether each section of the scheme should be charged this average price, or whether a graduated scale of charging should be adopted, based on the load factors of the various supplies given.

An accompanying table gives the capital expenditure necessary with steam traction to provide the additional rolling stock required to deal with a 20 per cent. increase of traffic.

Capital Expenditure on Rolling Stock Necessary with Steam Traction to Deal with a 20 Per cent. Increase of Suburban Traffic (Whole System.)

Lengthening and strengthening 344 45-ft. coaches and providing new axles and bogies	£127,423
Lengthening and strengthening 75 59-ft. coaches and providing new axles and bogies	19,500
Necessary alterations to provide desired proportion of first and second-class accommodation	5,709
Credit made to country service for 114 coaches taken into suburban working	67,830
10 BDbd coaches in course of construction, 1906	13,170
68 new second-class coaches	102,000
49 new first-class coaches	78,400
12 new locomotives, E class	25,200
Total	£439,232
10 per cent. for contingencies	43,923
Total	£483,155
Credits for the release of fixed wheel base passenger stock, short bogie trucks and out-of-date wheels and axles	74,797
Total net cost	£408,358

Another table gives the total capital expenditure required to deal with this increased traffic under steam working, proportioned, on a train mile basis, to the different electrification stages which we have adopted throughout this report.

*Total Capital Expenditure at Each Stage Necessary with Steam Traction to Deal with a 20 Per Cent. Increase of Suburban Traffic.**

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
Capital expenditure rolling stock†	£37,315	£141,019	£264,008	£408,358
Cost of bridge alterations.‡	4,415	8,926	10,688	17,232
Total	£41,730	£149,945	£274,696	£425,590

*This table includes nothing for any increase in the terminal capacity or number of roads which may be necessary to deal with the increased traffic by steam, but which will not be necessary with electric traction for some considerable time.
†Necessary with steam traction to deal with a 20 per cent. increase of suburban traffic allocated on a train-mile basis.
‡Necessary with steam traction.

A table gives in detail the corresponding increase in the operating expenses, also divided into stages. The operating expenses referred to in this and the following tables are those which would be varied by the introduction of electric traction. The items dealt with are, generally speaking, analogous to "locomotive and rolling stock expenses." I include, however, in the case of electric traction, the maintenance of the conductor rail which would be dealt with by the permanent way

Operating Expenses with Steam Traction to Deal with a 20 Per Cent. Increase of Suburban Traffic.

Operating expenses in 1906—	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
Transportation	£1,429	£5,739	£10,596	£15,911
Rolling stock (excluding coal)	13,229	49,280	92,323	143,277
Rolling stock (coal only)*	3,581	13,358	25,140	38,829
Train lighting	1,034	3,264	5,409	7,854
Total	£19,273	£71,641	£133,468	£205,871
Addtl exp. of increase traffic	3,827	14,236	26,629	41,096
Total operating expenses†	£23,100	£85,877	£160,097	£246,967

*These figures allow for the estimated increase in the price of coal from 10*s.* 2*d.* per ton in 1906, to 14*s.* per ton in 1912.
†These figures only include the operating expenses referred to in the text.

staff and which is, of course, an additional expense compared with steam traction. I also include, in the case of both electric and steam traction, the total amount of the guards' wages, because, on account of the increased service proposed with electric traction, this item is greater than it would be with steam. In the case of electric traction some addition may have to be made to the station staff to deal with the more frequent service and this has been allowed for.

(To be continued.)

General News Section.

The territorial legislature of Arizona is considering a bill to establish a railway commission of three members, and it is said that it is pretty sure to pass. It is proposed to have one of the members a lawyer and one of them familiar with the art of railroading. The salaries of all three are to be $2,500 a year each.

In the year 1908 the police department of the Baltimore & Ohio recorded more than 9,000 arrests, all made by the railway officers. These arrests resulted in conviction in about 80 per cent. of the cases. Thirty-nine sentences were for penitentiary offences, 3,700 for imprisonment in jails and workhouses, and 143 to reform schools and asylums; and in 2,400 cases fines were imposed.

The Cunard steamship "Mauretania" passed Daunt's Rock at 9.47 a.m., March 2, establishing a new record for the eastbound passage from New York of 4 days, 20 hours, and 2 minutes. Her average speed for the run was 25.28 nautical miles per hour. The "Mauretania" sailed from New York Feb. 25 and passed the Ambrose Channel Lightship at 8.45 a.m. The distance for the long eastbound course is 2,934 miles.

The Louisiana Railroad Commission announces that an order will be issued directing the New Orleans & Northeastern to install an approved block signal system from Slidell to New Orleans, 28 miles. The trains of the New Orleans Great Northern run over this part of the N. O. & N. E. to reach New Orleans, and it was here that a Great Northern train ran into one of the N. O. & N. E. last November, killing eight passengers. The commission gives the road 12 months within which to carry out the order—a task which no doubt could be accomplished in one month or less.

According to a press despatch from Washington, the Secretary of Commerce and Labor has held a conference with labor leaders concerning their recommendation that a bill be submitted to Congress providing for the inspection of locomotive boilers by the government; and the Secretary is quoted as saying that the work now being done by the government in the inspection of the boilers of steamboats should be extended to include locomotive boilers, with a view to preventing the appalling loss of life by railway accidents. The report says that the conference resulted in a decision to draft a bill, but this action was undoubtedly taken too late to have any influence on the 60th Congress.

In the Lower House of the Canadian Parliament, in a recent discussion on the Intercolonial Railway, a statement was read showing the number of permanent and temporary employees for each month of 1908, from which it appeared that the number of the permanent employees remained fairly constant during the year, standing at about 7,500, while the number of temporary employes fluctuated greatly, and the fluctuation was made the basis of charges of political manipulation and bribery. From January to April inclusive it was 700 to 800; and from that time on the figures were:

May	1,685	September	1,962
June	2,156	October	2,922
July	1,953	November	1,881
August	1,793		

Thus the number jumped by a thousand in the election month and dropped by over a thousand in the following month. The pay-roll was $499,000 in September, $538,000 in October, and $480,000 in November.

Daniel Willard, Second Vice-President of the Burlington, has issued a pamphlet urging employees of this road to oppose proposed legislation in the various states that would reduce the road's earnings or impose new burdens on it. In 1907 the Burlington appropriated $16,000,000 for betterments, extensions and new equipment. In 1908 the appropriation for these purposes was only $8,000,000, and in 1909 it is only $1,000,000. Mr. Willard makes it clear that these reductions in expenditures are due largely to anti-railway agitation and legislation. The road is being well maintained and operated but owing to the reduction in expenditures for additions and betterments, the number of employees was reduced from 53,000 in October, 1907, to 35,000 four months later, and the number is still much smaller than formerly. Mr. Willard says that he does not mean to assert that laws already made must be unmade or that wages must be reduced, but "we must be given time to work out the new problems that have been forced upon us; to see what it is going to cost to meet new requirements, and how much our revenues are going to be reduced. Perhaps by new methods growing out of the exigencies of the case we may still be able to earn a surplus sufficient to justify the resumption of extraordinary expenditures. If not, then either rates must be advanced or wages be reduced, or improvements must wait, or be carried on with borrowed money, and railways will be slow to increase their interest-bearing debt under such circumstances."

Sympathy and Discipline.

While the officials of the road and the members of the Grievance Committee will not disclose the result, it is learned that the poll of the conductors on the Atlantic system of the Southern Pacific, just concluded, favors a strike if Conductor Stockwell is not reinstated. Vice-President Fay has issued a circular setting forth that Stockwell was discharged for saying "To hell with bulletins"; and that he will not be reinstated.—*New Orleans Picayune.*

Undue Discrimination—Referred to I. C. C.

Eight San Francisco belles, the guests of the *Sunset Magazine*, published by the Southern Pacific Railroad, will arrive in New Orleans Sunday on their way to Washington and New York. The young ladies are the winners in a subscription contest given by the magazine, and all their expenses are being paid by the publication. They will go to Washington over the Louisville & Nashville. On the return trip they will visit Niagara Falls, Chicago and other points of interest.—*Picayune.*

New Railway Laws in Oregon.

The Oregon legislature at the session which has just closed passed several laws for the regulation of railways. The salient provisions of the new laws, of which there are seven, are as follows:

(1.) Railways are forbidden to make any contract or agreement, except by leave of the commission, to change their common law liability in the transportation of live stock. The commission shall prescribe a just and reasonable uniform live stock contract, which shall, within 30 days, be used by all railways. Penalty for violation $100. This act is the result of the refusal by the railways to eliminate certain provisions in their live stock contracts which were objected to.

(2.) The original Railroad Commission act was amended to meet the views of the Supreme Court of the United States, as expressed in the Minnesota rate case. The law as amended provides that when an injunction is issued to suspend an order of the commission respecting rates or transportation, the court shall require a bond from the roads applying for the injunction to answer for all damages caused by the delay in the enforcement of the order of the commission, and to compensate for sums paid in excess of the rates fixed by the commission. No appeal to the state supreme court shall stay the operation of any order of the commission unless the circuit or supreme court shall so direct, and unless the railway appealing shall give a bond.

(3.) The members of the commission and its employees may ride on any engine, car or train on payment of fare, but no railway shall therefore be deemed to become a common carrier of passengers except on passenger trains.

(4.) Railways are required, on application of any lateral or branch line, or of any shipper, to construct and operate on reasonable terms a track connection if it can be reasonably

done, and shall furnish cars for traffic offered in carloads; and live stock, perishable property and explosives shall have precedence over other traffic. If a railway refuses to provide a connection the commission is authorized to make a reasonable order. The cost of ties and grading shall be borne by the applicant.

(5.) The law requiring the railways to furnish the commission with lists of free passes is amended so as to provide that the commission, in its discretion, may exempt any carrier from furnishing a statement of trip passes issued to persons regularly and exclusively in its employ; but the carrier must keep a record of all such passes which shall be open to the inspection of the commission for two years.

(6.) Railways are prohibited from giving undue or unreasonable preference to any particular locality, but necessary preference may be given to live stock and perishable freight.

(7.) The act of October 24, 1874, and acts amendatory thereto, granting to the Willamette Valley & Coast, all the tide and marsh lands in Benton county, has been repealed. It does not appear that these lands have ever been surveyed by the state or the railway, and the company has never asserted title to or paid taxes upon them; and by the decision of the Supreme Court of the United States in Illinois Central v. Illinois, 146 U. S. 452, the title to tide lands belongs to the state, in trust for the people. The lands in question are now claimed by the Corvallis & Eastern, a Harriman line, which bought the property of the Willamette Valley & Coast.

The foregoing measures were framed or endorsed by the Railroad Commission. Through the efforts of the commission several measures were killed, including a 3-cent maximum fare bill, a 2½-cent maximum fare bill, a bill to penalize slow movement of or delays to live stock in transit, and a measure to require all rail transportation companies to provide all coaches with toilets and drinking water, and to punish the President, Vice-President and Directors for each violation by fine or imprisonment.

Electrical Engineering Fellowships at University of California.

The Recorder of the University of California announces the establishment, under the gift of Clarence W. Mackay and his mother, of two fellowships in electrical engineering, of an annual value of $600 each, open to all properly qualified university graduates. The object of these fellowships is to provide for post-graduate research work. Recipients will reside at the University of California.

Nickel-Chrome Rails.

The Bethlehem Steel Co., South Bethlehem, Pa., has, during the past year, sold several thousand tons of nickel-chrome rails. Most of the sales have been to steam railways for use on curves or at other points where rail wear is heaviest. The toughness of nickel steel rails has been recognized for some time, but they have not been hard enough to be of particular advantage. The addition of chrome gives the desired hardness. The Bethlehem company recommends three-quarters of 1 per cent. chrome and 1½ per cent. nickel. The price is about $51 a ton. As these rails have been in track for only a comparatively short time, it is not possible yet to give any reliable figures as to their service.

Division of the Santa Fe Into Two Operating Districts.

As announced in the *Railroad Age Gazette* last week, the Atchison, Topeka & Santa Fe proper, which includes the entire Atchison system except the Coast Lines and the Gulf lines, is to be divided into two operating districts. J. E. Hurley, now General Manager of all divisions, is to be General Manager of the "eastern lines," including the Illinois, Missouri, Kansas City, Eastern, Middle, Oklahoma and Southern Kansas divisions, with their branches, with headquarters at Topeka, Kan., and C. W. Kouns, now Assistant to the Second Vice-President, is to become General Manager of the "western lines," which will include the Western, Arkansas River, Colorado, New Mexico, Rio Grande and Pan Handle divisions, with their branches, with headquarters at Amarillo.

This division of territory has been necessitated by the growth both of traffic and of mileage. In 1900 the portion of the Atchison system now to be divided comprised 4,935 miles. Since then 1,185 miles have been added, making the total present mileage 6,120 miles. Besides, it has been found necessary to double-track between Chicago and Newton, Kan., 451 miles of second track having been already built, and the remainder is to be built as rapidly as practicable. On the lines to be divided the volume of business in the year ended June 30, 1900, was 6,941,011,408 ton miles; while in the year ended June 30, 1908, it was 11,333,122,916 ton miles, or an increase of 63 per cent. in gross weight handled. The train mileage in the fiscal year 1900 was 11,029,503 miles, while in the fiscal year 1908 it was 13,206,716 miles, being an increase of 20 per cent.

Grand Trunk Shops at Stratford, Ont.

The Grand Trunk shops at Stratford, Ont., were formally opened on February 18. The occasion was celebrated with a banquet given by the city to General Manager Hays and a number of other officers. This plant, which covers an area of about 21 acres, is said to be the best equipped shop in Canada. The buildings are of concrete and steel construction throughout and heated by hot air. The tools are operated by electric drive. There are five electric cranes, the largest being 120-ton capacity and the smallest 10 tons. The power plant, which has a concrete chimney 186 ft. high, is equipped with vertical water tube boilers with chain grates. The engine room contains one compressor, with a capacity of 2,150 cu. ft. of free air per minute and also two 400-k.w. and one 300-k.w. generators. There are about 1,000 men employed in this shop.

Concrete Water Tank in Mexico.

At Empalme, Mexico, where the Cananea, Yaqui River & Pacific makes connection with the old Sonora branch of the Southern Pacific, a water tank built entirely of concrete has just been erected by Carl Leonardt, a contractor of Los Angeles, Cal. It rests upon a concrete foundation and is 110 ft. high. Its inside diameter is 30 ft. and its capacity is 400,000 gallons. The erection of this tank was largely in the nature of an experiment, and since it was built it has been decided to erect tanks of this kind at other points on the road. Some of these other tanks will, it is said, be much larger than the one at Empalme.

New Bridges on the C. Y. R. & P.

Announcement has been made that the temporary bridges over several rivers crossed by the Cananea, Yaqui River & Pacific will be replaced by concrete structures. The largest of these, the one over the Yaqui river, will be 1,216 ft. long and will consist of 16 spans. The culverts on the new line are to be of concrete also. The Mountain division, between Tepic and Orendain, will necessitate a large amount of concrete construction, as many ravines and barrancas will be crossed.

Grand Crossing Track Elevation.

Grand Crossing, Chicago, seems at last to be in the way of being abolished. The question of elevating a part of the roads, which has been pending for about two years, because of the inability of the roads concerned to come to an agreement regarding plans and a division of the cost, will probably be settled shortly by arbitration. The roads involved, the Illinois Central, the Lake Shore, the Pennsylvania, and the New York, Chicago & St. Louis, have agreed to submit the questions in controversy to a board of five executive officers of disinterested railways, each of the four roads to select one, and these four to select the fifth. We understand that these selections have already been made, although the names have not yet been made public.

It will be recalled that at the point where this separation of grades is to be made the Pennsylvania and the Lake Shore cross the Illinois Central and the Nickel Plate almost at right angles. The cost to raise all these tracks to ordinance grade, within the territory affected by this particular ordi-

nance, was estimated at $4,000,000, there being six tracks for the Illinois Central, four each for the Lake Shore and Pennsylvania, and two for the Nickel Plate. But it was desirable, as well as necessary, that the grades of the intersecting railways also be separated, the north and south lines from the east and west. The plan which will be submitted to the arbitration board provides for raising all the tracks, but for running the Pennsylvania and Lake Shore above the Illinois Central and the Nickel Plate. The added cost will be about $1,500,000 as compared with leaving all tne tracks just high enough to clear the street traffic. It is regarding this plan, and an equitable division of the extra cost, that the arbitrators will be asked to decide.

Wireless Telegraph on the Lake Shore.

On Saturday last the Marconi wireless telegraph was tried between a moving train of the Lake Shore & Michigan Southern and the Marconi office at Cleveland. A sending apparatus was installed on westbound passenger train No. 35, second section, and messages were sent from a point 80 miles east of Cleveland, and also from Sandusky, 60 miles west of Cleveland; and while the train was moving between these places. Messages were sent while the train was running at the highest speed. There was no sending apparatus at Cleveland.

Standardization on the Rock Island-Frisco System.

The appointment of A. S. Greig, Assistant to the Chairman of the Executive Committee of the Rock Island-Frisco system, and Edward S. Moore, Second Assistant to the President of the Rock Island, as a Committee on Standardization, is a step toward the adoption of more uniform methods, materials and appliances on this system. Much equipment and many structures have been standardized already. But it is felt by the management that much greater uniformity, extending even to details, should be secured to promote both economy and efficiency. Committees containing representatives of the different roads in the system have been appointed heretofore to investigate and report on the desirability of uniformity in various matters, but the committees have lacked authority to enforce their recommendations, and in many cases their work has not been fruitful.

Chicago Harbor Commission Report.

The Harbor Commission appointed by Mayor F. A. Busse, of Chicago, to investigate and report on the harbor needs of Chicago has made its report. The Commission is composed of Charles H. Conover, Frederic A. Delano, J. M. Ewen, Alderman Charles L. Foell, Alderman Peter L. Hoffman, Isham Randolph, Charles H. Wacker and Alderman John P. Stewart. It favors the creation of a harbor which shall extend along the lake front from Waukegan, Ill., to Gary, Ind., and shall include the Chicago and the Calumet rivers. The commission makes numerous detail recommendations. These include the survey of the dock lines on the Chicago river and its branches, the lake front and the Calumet river, and the determination of all rights of ownership; the widening of the Chicago river above its branches to 250 ft.; the replacing of the center pier and narrow span bridges on the main river, and the South branch with bridges having a clear span of 200 ft. with straight bottom chords instead of arched chords; the illumination of the Chicago river by electricity; the straightening of the entire river at different points and the widening of both its branches; the widening of the Calumet river to a minimum of 300 ft. to where it forks; a technical engineering study as a basis for the progressive improvement of the North branch of the Chicago river; the reservation of the lake front between Chicago avenue and the mouth of the Chicago river for future harbor development, and the construction here of piers for the accommodation of passenger, package freight and fruit shipments; the reservation of the lake front from the mouth of the Chicago river to Randolph street for future harbor development; the securing of title to the right-of-way of the Illinois & Michigan canal for the benefit of the city of Chicago; the replacing of the present bridges in the Calumet river so that hereafter all bridges shall have two openings of 100 ft. or a single opening of 200 ft.; the reserving of the frontage of the Calumet river for the construction of public docks; the creation of an inland harbor on Lake Calumet; the creation of a harbor department in charge of a commission; the appointment of a competent engineer to have charge of surveys and prepare detailed plans, specifications and estimates of cost of the suggested improvements and of an advisory board of seven persons to co-operate with this engineer; the obtaining of a grant from the legislature of power for the city to construct and operate or lease wharves, docks, levees, etc.

New Power Plant in New Brunswick.

The contract for the construction work involved in the hydro electric development of the Grand Falls Power Co. on the St. John river at Grand Falls, New Brunswick, has been placed in the hands of Frank B. Gilbreth, New York. John B. McRae, Ottawa, Ont., is Chief Engineer and Ralph Mershon, New York, is Electrical Engineer. This plant will generate 100,000 h.p. in electric current, which will be furnished to various cities throughout New Brunswick and Maine. Grand Falls is on the Canadian Pacific, about 200 miles north of St. John, and about two miles east of the Maine state line.

The work involves, among other features, the construction of a number of shafts in rock excavation 130 ft. deep, a power chamber 30 ft. by 260 ft. and 130 ft. deep, a tail race tunnel 28 ft. in diameter and 2,400 ft. long and a power-house 350 ft. long and 260 ft. wide. The intake shafts will be nine in number, and 12 ft. in diameter, 130 ft. deep. The plant will be equipped for high potential and long distance transmission. Actual construction will be begun immediately and will be pushed through to completion at an early date. The falls and water power on the St. John river at this point are the largest in eastern Canada and this development will result in the establishment of a large number of manufacturing enterprises. The total head developed will be 135 ft. Numerous auxiliary works, substations and long-distance transmission lines will be erected. The total cost will be over $5,000,000.

American Society of Civil Engineers.

At a meeting held on March 3, two papers were presented for discussion, as follows: The Action of Frost on Cement and Cement Mortar, Together with Other Experiments on These Materials, by Ernest R. Matthews and James Watson, and The Bonding of New to Old Concrete, by E. P. Goodrich, M. Am. Soc. C. E. These papers were printed in Proceedings for January, 1909.

Engineering Society of Wisconsin.

The Engineering Society of Wisconsin was organized at the University of Wisconsin Feb. 26, some 150 city engineers, general managers of power and traction companies, contracting engineers, superintendents of water and light plants, mechanical and civil engineers and superintendents of highway construction becoming charter members. The officers elected were: President, Dean F. E. Turneaure, University of Wisconsin, College of Engineering; Vice-President, City Engineer M. Dodge, of Appleton; Trustees for two years, B. F. Lyons, Beloit Gas & Electric Co., and E. P. Worden, Prescott Steam Pump Co., Milwaukee, and Trustees for one year, E. Gonzenbach, of the Sheboygan Electric Light & Power Co., and City Engineer E. R. Banks, of Superior. These, as executive board, will elect the secretary later. At the opening session, Feb. 24, the highway work of the state geological survey, the use of tar, oils and emulsions on macadam and earth roads and pavements were discussed. Conservation of forests and water resources of Wisconsin was discussed by State Forester Griffith. Senator T. W. Brazeau, Senator E. E. Brown, Assemblyman J. R. Jones and Prof. D. W. Mead. Prof. W. D. Pence, engineer for the Wisconsin Railroad Commission, described the organization of the commission's engineering staff. The new problem of standards of gas and electric service was discussed. The electric interurban roads of Wisconsin were discussed by F. G. Simmons. The second night was given to a discussion of water powers by W. G. Kirchoffer and Prof. D. W. Mead.

Papers were read on the waterproofing of concrete by F. M. McCullogh; municipal engineering in the Orient and in Porto Rico, by J. T. Hurd and Edwin Wray; gas producers and small power stations, by V. E. McMullen and C. T. Atkinson, and the Madison concrete storm sewer system, by John F. Icke.

Railway Signal Association.

The March meeting of this association will be held at the Auditorium Hotel, Chicago, on Monday, the 15th, beginning at 10 a.m. In the forenoon E. E. F. Creighton, of the General Electric Co., will speak on lightning phenomena. In the afternoon, beginning at 2 o'clock, there will be a debate on the question:

"Resolved, That the scheme of signaling presented at the Washington meeting is the best scheme of signaling devised to date."

Two speakers will appear for the affirmative, and two for the negative, for a period of 20 minutes each, after which the discussion will become general. After the close of the general discussion, each side will be allowed 10 minutes in which to close the debate, after which a vote of all those present will be taken to reach a decision.

In the notice for this meeting the Executive Committee announces the adoption of all of the seven reports which were considered at the Washington meeting last October and were referred to letter ballot. The ballots were counted on February 2 and the votes by which the different propositions were adopted are given below, together with the numbers of the pages on which the subject is to be found in the Proceedings of last year (Volume XI., No. 4).

Results of Letter Ballot.

Pages.		For.	Agst.	Tot'l
251-276	Specifications for mechanical interlocking plants.	508	34	542
200-232	Specifications for electric interlocking plants...	514	29	543
420-435	Specifications for automatic block signal work..	528	31	559
307-308	Automatic stops and cab signals. Requisites of installation.	464	103	567
282-298	Rules for care of storage batteries.	548	27	575
390-405	Specifications for rubber-covered wire.	387	169	556

Standard Methods and Designs, Pages 345-386.

Specifications for:	For	Agst.	Tot'l
One-inch pipe and coupling	541	29	570
Gray iron castings	567	3	570
Malleable iron castings	569	1	570
Machinery steel	569	1	570
Wrought iron bars	569	1	570
Signal roundels, lenses and glass slides	567	3	570
Designs:			
1001, wire adjusting screw	567	2	569
1002, pipe adjusting screw	536	32	568
1003, obtuse angle compensator crank	567	2	569
1004, acute angle compensator crank	567	2	569
1005, three arm crank	568	1	569
1006, straight arm crank	568	1	569
1007, right angle crank	568	1	569
1008, one way crank stand	485	84	569
1009, two way crank stand	468	101	569
1010, one and two way crank pins	557	12	569
1011, one way crank stand complete	484	84	568
1012, two way crank stand complete	468	101	569
1013, one way compensator base	566	1	567
1014, pipe compensator	536	32	568
1015, one-inch pipe and coupling	518	51	569
1016, straight solid jaw (tang end)	522	48	570
1017, offset solid jaw (tang end)	521	48	569
1018, wide jaw (tang end)	538	31	569
1019, slotted jaw (tang end)	536	32	568
1020, screw jaw	569	1	570
1021, screw jaw (tang end)	539	30	569
1022, solid jaw (butt end)	568	1	569
1023, lug (tang end) for one-inch pipe	520	49	569
1024, straight adjustable link	565	1	566
1025, solid link	568	1	569
1026, standard ladder for pipe signal post	484	84	568
1027, top of ladders	483	85	568
1028, sides for ladder stays	501	67	568
1029, front and back clamps for ladder stays	512	56	568
1030, standard pipe signal post	548	19	567
1031, standard pipe signal post	548	19	567
1032, standard pipe signal post	548	19	567
1033, jaw pins	537	32	569
1034, base for six-inch signal post	508	60	568

Engineers' Society of Western Pennsylvania.

At a meeting of the Structural Section on March 2, a paper on Observations on Structural Shop Management was presented by Samuel E. Duff. The subject was taken up under the following subdivisions: Complete Information in Shop; Arrangement of Drawing Room; Ordering Material; Regarding Material Ordered; Receiving and Inspecting Material; Handling and Storing Material; Placing Material in Shop; Wood Templates v. Steel Templates; Laying Out; Punching, Automatic Spacing, Shearing; Fitting Up, Riveting, Finishing; Shipping.

Civil Engineers' Society of St. Paul.

The officers for 1909 are as follows: President, H. J. Bernier, Assistant Chief Engineer of the Minneapolis, St. Paul & Sault Ste. Marie; Vice-President, J. D. Du Shane, Assistant United States Engineer; Secretary, D. F. Jurgensen, 116 Winter street, St. Paul, Minn. The regular meetings of the society are held in the club room in the City Hall on the second Monday of each month, except June, July and August.

Central Railway Club.

At the meeting on March 12, John McE. Ames, M. E., American Car & Foundry Co., New York, will present a paper on The Use of Steel in Passenger Car Construction. The standing Committee on Rules of Interchange will present its annual report, which will include consideration of the abuse of the M. C. B. repair card.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.: May 11-14, 1909; Richmond, Va.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; May 11; St. Louis, Mo.

American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th street, New York; second Friday in month; New York.

American Railway Association.—W. F. Allen, 24 Park Pl., New York; May 19, 1909; New York.

American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N.Y.; 2d Tues. in month; annual, Dec. 7-10; New York.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.

Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; last week in May, 1909; Detroit, Mich.

Association of Railway Telegraph Superintendents—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., N. Y.; April 27-30, 1909; Louisville, Ky.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; June 21-23, 1909; Chicago.

International Railway General Foremen's Association.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in mnth. ex. June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

North-West Railway Club.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.

Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; May 17-19; Chicago.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis

Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.; April 15; Atlanta, Ga.

Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The trunk lines have postponed until April 30 the date when agents will refuse to sign bills of lading made out on the old forms.

The Mallory and Morgan steamship lines have made a reduction of five cents per 100 lbs. on cotton from Galveston to New York, a result of the competition introduced by the Texas City Steamship Co. The rate is now ten cents. It is not yet certain that the cut will have much effect on the volume of shipments.

The Pacific Mail Steamship Company has announced a reduction of about 25 per cent. in eastbound freight rates between San Francisco and New York. It is reported that a plan of San Francisco parties to establish a line of steamships from San Francisco to La Boca, Panama, connecting with the Panama Railroad, caused the reduction.

The Southern Railway has announced that its new standard bill of lading will be put in use April 1. The form has been modified somewhat from that prescribed by the Interstate Commerce Commission. The freight traffic manager has issued a circular intimating to shippers that forms printed on cheap paper in very small type are objectionable.

At a meeting of the Atlantic import committee of the Trunk Line Association at New York last Tuesday, it was decided to take action on the Boston & Maine's rate cutting. The first cut of one cent in the commodity rate on import freight from Boston to western points was made by the Boston & Maine in January, and was promptly met by the Baltimore & Ohio, Chesapeake & Ohio, Pennsylvania, Reading and Boston & Albany. This action of the other lines practically nullified the advantage which the Boston & Maine had hoped to gain, and a few weeks later it announced another similar cut. It was thought that the other roads would retaliate. The action this week leaves the situation unchanged.

The New Jersey State Agricultural College and the Pennsylvania Railroad are to co-operate in running a farmers' educational train through southern New Jersey on March 8, 9 and 10. Nineteen stops will be made, and at each of the stations lectures will be given on soil fertility, potato and strawberry production, alfalfa, corn and dairy products. Large posters are to be displayed in prominent places in the section through which the train is to run. The State College authorities will send the farmers personal letters. On the train from the State Agricultural College will be Dr. Edward B. Voorhees, Edward Van Alstyne, K. C. Davis and M. A. Blake. Division Freight Agents W. W. Wimer, Jr., and Wm. Coffin will represent the railway.

Calvert's Monthly, a commercial journal published at Chicago, gives in its February number the results of an investigation to ascertain whether the railways were justified in raising freight rates. Its editors believed that the advances were not justified. It employed as investigators newspaper men at Chicago, New York, Philadelphia, Boston, St. Louis, Kansas City, St. Paul, Omaha, San Francisco and Portland, and instructed them not to seek the views or opinions of railway officers or shippers, but only facts, figures and actual conditions. The article giving the results of the investigation is quite long and the conclusion reached is "that the roads were actually forced to take some action for their preservation. The increase in rates was necessary if the prices of the commodities used by the companies and of the labor employed were not reduced."

Howard Elliott, president of the Northern Pacific, in a letter to the business men of Portland, concerning his refusal to open the Portland gateway to the Union Pacific, says:

"The Union Pacific desires to get the benefit of the business the Northern Pacific has developed for the last thirty-five years at Puget Sound, and to obtain that benefit, not by making an investment of money, but by a demand that the Northern Pacific turn over the use of its property to the Union. The Northern Pacific has offered to rent its physical property on very reasonable terms, the Union Pacific then to share in the risks of operation and management, but this offer was declined. The Northern Pacific has spent a great many millions of dollars at Portland, in doing which it was obstructed by the Union Pacific in many ways. If the commission decides to put our property at the use of the Union Pacific, we should, in self-defence, have to have the matter tried out in the courts."

The railways belonging to the Transcontinental Freight Bureau have decided to modify a number of the advances in rates that they put into effect on January 1. They gave a hearing to shippers at Chicago lasting from January 28 until February 26, and were convinced by the arguments of shippers that some of the advances made were too great. Among the commodities upon which the westbound rates will be reduced from 3 per cent. to 25 per cent. are oil, wagons and vehicles, agricultural implements, beer, cotton-seed oil, wire fencing, pig iron and linseed oil. Among the commodities on which the eastbound rates will be reduced are cocoanut oil, deciduous fruits, leather and tin scrap. Reductions are made not only in rates to and from the Pacific coast, but also in some cases to and from points intermediate between Chicago and the coast. The changes are so numerous and affect such a wide variety of commodities that it would be impossible adequately to summarize them here.

The railroad committee of the Iowa Senate has reported favorably a bill to amend the long and short haul clause of the existing Iowa railway law. The proposed legislation would authorize railways to base rates between competing points on the short line mileage, but would prohibit any road from making any rate to a given point that was higher than a rate to a point beyond. As the Iowa law has been applied in the past, a road having the long line between two points could not meet the rate by the short line without reducing all intermediate rates so that they would be as low in proportion to mileage as the rate to the competitive point. The result has been that at many points the roads have refrained from meeting one another's competition because they would be compelled in consequence to sacrifice more than they would gain. The avowed purpose of the proposed legislation is to give shippers at competitive points a chance to ship by either of the competing lines at the same rate. The distance tariff in the past has probably been more rigorously enforced in Iowa than in any other state, and the fact that the legislature seems disposed to modify the law and that it is being urged to do so by shippers, shows that the people of the state are beginning to appreciate the fact that this phase of their railway policy has hurt their interests more than it has benefited them.

It appears that the appeal of the Grand Trunk Railway against the order of the Canadian Railway Commissioners requiring it to run a third-class train between Montreal and Toronto (noted last week, page 427) was taken up to the Privy Council of Great Britain, which considered the matter on February 15 and 17 in London. It was dismissed, however. The Commissioners' order was based on an old section of the Grand Trunk Act of 1852, which had been treated by the company and everyone else as obsolete. The chief question involved in the appeal was whether the provisions of the 1852 Act in reference to tolls and third-class carriages, which have in fact never been acted on, were impliedly repealed by the general railway act of 1906. It was contended by the company that the 1906 Act, by vesting in the Commissioners the power and authority to regulate the rates and tolls of every railway in Canada, was inconsistent with and repugnant to the 1852 Act. The Privy Council, however, holds that the old Act is still in force. The railway between Toronto and Montreal was constructed and operated under powers granted to an entirely new Grand Trunk Company by the Amalgamation Act of 1854; Section 3 of the 1852 Act was never acted on during the railway's existence; by the Acts of 1854 and 1859 the directors of the new undertaking were empowered to vary all tolls; and by Acts of 1859, 1868 and 1879 the Governor in Council—and subsequently by Acts of 1903 and 1906, the Commissioners—had full power to alter tolls on all Canadian railways, but the argument based on these facts was, however, rejected.

INTERSTATE COMMERCE COMMISSION.

Rates on Grain and Flour from Missouri River to Chicago.

August J. Bulte Milling Co. et al. v. Chicago & Alton et al. No. 1123 and No. 1129. Opinion by Commissioner Harlan.

Complainants concede the reasonableness of the proportional rates applicable east of Chicago and the Mississippi river in making up the through rates on flour from the Missouri river to the seaboard, but condemn the proportional rates applied between the rivers and to Chicago as unreasonable in themselves and unduly discriminatory when compared with the proportional rates from Minneapolis to Chicago.

The circumstances and conditions surrounding the transportation of flour through Chicago from Minneapolis to the seaboard for export or domestic consumption are substantially dissimilar to the circumstances and conditions surrounding the traffic through Chicago from Missouri river points, in that the lower proportional rates from Minneapolis to Chicago are the direct result of the competition of lake and rail routes. Where a well sustained water competition exists that takes a substantial portion of the tonnage and could readily prepare to take it all, if left in undisturbed control of the traffic, the rail line, without necessarily subjecting itself to charges of discriminating against other localities, may adjust its rates so as to fight for the whole tonnage the moment it really feels the effect and influence of its competitor's rates; it need not wait, as complainants contend, until the water line is prepared to take half the tonnage.

While a division of a through rate long accepted by a carrier may often be pertinent evidence, it is not a sound final test of the reasonableness of the through rate itself. Nor is the rate per ton per mile the generally accepted basis in this country for making up interstate rates.

The manufactured product commonly takes a higher rate than the raw material from which it is made. But the maintenance of a parity of rates on wheat and flour between the Missouri river and the Atlantic seaboard tends to equalize conditions at all points at which flour-milling enterprises exist, and seems on many grounds to be a sound rate policy in that territory. Complainants' suggestion that the flour-milling industry of this country can be fostered by an order requiring carriers to the Atlantic seaboard to maintain a lower rate on flour than on wheat involves a matter of national policy beyond the authority of the commission to adopt until the Congress, by adequate legislation, has made that a rule of transportation.

The Spokane Case.

City of Spokane, Wash., v. Northern Pacific et al. Opinion by Commissioner Prouty.

The complaint was based on two grounds:

1. That rates from eastern destinations to Spokane were higher than those to Seattle, a more distant point.

2. That the rates to Spokane were inherently unreasonable.

On the first point the defendants claimed that water competition compelled them to charge the rates in effect at Seattle and that therefore they might charge a higher rate to Spokane without violating the long and short haul provision, or without discriminating under the third section. The commission sustains the claim of the defendants. It shows that rates to Pacific coast terminals are controlled by water competition and that higher rates to interior points like Spokane are not of necessity unlawful.

On the second point the commission sustains the claim of the petitioner and holds that rates from eastern destinations to Spokane charged at the present time are unjust and unreasonable. It reduces class rates from St. Paul to Spokane 16⅔ per cent. and makes substantially the same reduction from Chicago to Spokane. Rates east of Chicago are not dealt with.

Nearly all commodities to the cost move under commodity rates, and these were the principal subject of complaint on the part of Spokane. Rates from all points on the Missouri river and east to Seattle are the same, while rates from the same points to Spokane are usually considerably higher than to Seattle, and increase as the point of origin lies further east.

The complainants referred, as illustrative, to 32 articles. The commission holds that it can only fix rates on the articles enumerated. The complainants insisted that the rates on these commodities to Seattle ought not to be exceeded at Spokane. The commission holds, with respect to 27 of these articles, that the rate from St. Paul to Spokane should not be higher than the rate from St. Paul to Seattle; with respect to five slightly higher rates to Spokane are permitted. Rates from Chicago to Spokane are made about 16⅔ per cent. higher than from St. Paul to Spokane.

Below is given a table showing the present rate on these articles, the rate established, and the reduction.

Commodity.	Rate—Present.	Rate—New.	Reduction.
Tin boxes and lard pails, NOS. Boxed, crated or jacketed. Nested in boxes, barrels or crates	190	100	90
Carpets, NOS	270	185	85
Plow points	164	110	54
Shovels, etc.	164	135	29
Fruit jars and glasses	190	100	90
Canned corn, etc.	125	90	35
Belting, cotton or rubber	205	120	85
Bicycles, boxed or crated	335	250	85
Blank books and tablets	170	125	45
Books, NOS, boxed.	225	140	85
Drugs and medicines	200	150	50
Cotton duck, etc.	185	150	35
Glass, etc.	138	90	48
Glass, all sizes, NOS	150	90	60
Paint, dry, etc. Paint, in oil, etc. White or red lead, dry or in oil, etc.	115	90	25
Paper bags, etc.	120	100	20
Rubber boots, and shoes	235	175	65
Saws, circular, etc.	228	150	78
Water heaters, etc.	230	170	60
Stoves and ranges (cast iron), etc.	155	130	25
Stoves (sheet iron)	220	150	70
Glassware, NOS	190	120	70
Rope and cordage, etc.	167	125	42
Wheelbarrows, KD, flat.	141	90	51
Windmills, KD.	155	135	20
Wire, copper	188	110	78
Wire, fencing, in rolls.	150	80	70
Woodenware, in packages.	174	125	49

In the hearing, the cost of reproducing the properties of the Great Northern and Northern Pacific, their financial history, their present capitalization, and their earnings in recent years, were all fully gone into, and are discussed in the report. The headnotes, in addition to those previously mentioned, are as follows:

1. The system of transcontinental rates now in force applies lower transportation charges from points of origin on the Missouri river and east to Pacific coast cities than are applied to intermediate interior points. This scheme of rate making has been forced by water competition between the Atlantic and the Pacific coasts, and the maintenance of the lower rate to the more distant coast point is not of necessity a violation of the third or the fourth sections, since water competition creates a dissimilarity of circumstance and condition between the interior and the coast.

2. Water competition may justify a difference in carload minimums and in the right of combining different commodities at the carload rate, as well as in the rate itself; but carriers should be prepared to justify such preference.

3. In determining what are reasonable rates between two poinst neither that railway which can afford to handle traffic at the lowest rate nor that whose necessities might justify the highest rate should be exclusively considered. Rates must be established with reference to the whole situation.

4. Certificates issued against the ore lands formerly owned by the Great Northern cannot be properly considered in determining what are reasonable earnings for that company at the present day.

5. The Great Northern has in the past distributed its stock issues among its stockholders at par from time to time, although the market value of the stock was often much above par. Without expressing any opinion on the legality or propriety of this practice, it is held that this fact, at this time, can have no bearing on the earnings to which that company is entitled.

6. Neither can the capital stock of the Great Northern be reduced for the purpose of determining what its fair earnings should be by the amount of that stock which was originally issued without consideration.

7. In determining what will be reasonable rates for the future the commission may properly consider that under the rates in effect a large surplus has been accumulated in the past, but it should not make rates for the purpose of distributing that surplus to the public.

8. The importance of the question whether a railway shall

be allowed to earn a return on the unearned increment represented in the value of its right of way is illustrated by the facts in this case, but is not discussed or decided.

9. On an examination of the history of these properties, the cost of reproducing them at the present time, the original cost of construction, the present capitalization, and the manner in which that capitalization has been made, it is held that the earnings of both the Great Northern and the Northern Pacific in recent years have been excessive.

The order in this case will be made effective on May 1 next. If the commission is satisfied that the carriers will require additional time to check in rates on other commodities and to other points, the effective date will, on application, be extended.

Limitations on Commission's Assessment of Damages.

S. R. Washer Grain Co. v. Missouri Pacific. Opinion by Commissioner Cockrell.

Complaint alleged unjust discrimination arising from the practice of defendant of allowing free commercial elevation at certain places and refusing the same, or a money compensation therefor, at Atchison. Based on this allegation indirect damages to a large amount were claimed as well as an attorney's fee. The evidence was that the complainant actually elevated a certain amount of grain, moving in interstate commerce over the defendant's lines. The Commission has condemned commercial elevation as practiced by the carriers, or money compensation therefor; at the time of the alleged discrimination, however, seven and one-half mills per 100 lbs. was considered a proper allowance in lieu of such elevation.

The Commission has jurisdiction, without regard to the amount in controversy, to award damages whenever they arise under the act, excepting in those cases where the act itself names another forum.

While the Abilene case, 204 U. S., 426, settles the primary jurisdiction of this Commission to determine the reasonableness or unreasonableness of an established rate and to award reparation predicated upon the unreasonableness of an established rate, the Commission's jurisdiction is primary also in matters of unjust discrimination, undue or unreasonable preference or advantage, undue or unreasonable prejudice or disadvantage, and, generally, whenever the Commission may order the carrier to cease and desist from violations of the act.

The Commission, in passing upon the reasonableness or unreasonableness of a rate, acts as an administrative body having quasi judicial functions; when it determines what the rate should have been and shall be in the future it exercises certain legislative functions; when it computes the damages or reparation due the shipper by reason of the enforcement and collection of a rate unreasonable to the extent that it exceeds a rate which is declared to be reasonable, there is a mere mathematical determination of the damages the shipper should receive. Reparation or damages, therefore, in all matters which concern rates, are reduced, after the Commission has determined what the reasonable rate should have been, to the simplicity of a mathematical calculation; elements of conjecture, speculation, and inference are entirely eliminated. In matters of discrimination, however, of undue preference, prejudice or disadvantage, a different field is entered, where the services of a jury may be necessary, not only by reason of the seventh amendment to the Constitution, but by the very nature of the subject-matter itself. It may be proper, and the Commission has so considered in many instances, to award money damages in cases of the kind just described, and such awards have been complied with by the carriers, but the proofs to support such awards should be very clear and exact; they should be free from surmise and conjecture.

Reparation, based upon the amount of grain actually elevated, allowed in this case because it is found that the free commercial elevation afforded shippers elsewhere discriminated against Atchison and affected the rates paid by the complainant to the exact extent of seven and one-half mills per 100 lbs. The Commission does not assess costs; nor does it allow attorney's fees; nor does its order for the payment of money have the effect of an order, decree, or judgment of a court; nor are such orders enforceable by process; nor do they become liens upon the property of a defendant.

STATE COMMISSIONS.

The Railway Commission of California in case No. 101 says that it is not governed by strict rules of evidence such as are observed by courts of law, its object being to arrive at the facts, and in so doing it follows the practice adopted by the Interstate Commerce Commission.

COURT NEWS.

The Supreme Court of Pennsylvania has decided that the state law stipulating the length of time goods may be kept in storage is invalid as far as it applies to goods in cars that are engaged in interstate commerce.

Judge Carland in the United States Court at Sioux Falls, S. Dak., March 2, granted a temporary injunction in the case involving the 2-cent passenger fare law, recently enacted by the state legislature. The injunction restrains the railway commissioners, the attorney-general and the state's attorneys of the various counties through which the lines run, from attempting to compel the railway companies to comply with the law. All passengers are enjoined from instituting actions against the companies for violating the law and from demanding that they be carried at a 2-cent rate.

In the Louisiana supreme court on February 24 the St. Louis & San Francisco consented to a judgment nullifying the contract by which the Frisco's trains were to enter New Orleans over the tracks of the Yazoo & Mississippi Valley. It is reported that a representative of the Frisco later announced that its trains would be running into New Orleans by June 1. It now reaches a point between New Orleans and Baton Rouge over the Colorado Southern and the New Orleans & Pacific. Seemingly the only other available entrance is over the tracks of the Louisiana Railway & Navigation Co.

The Illinois Terminal Association, operating a railway between Alton, Ill., and Edwardsville, and the Illinois Glass Company, which is said to own the Terminal Association, charged with paying illegal rebates, entered pleas of guilty in the federal court at Springfield, Ill., on February 24. The Illinois Terminal Association also pleaded guilty to failure to post and file freight rates. The Terminal Association was fined $4,000 and costs and the Illinois Glass Company $12,000 and costs, which were paid. It was alleged that through the common ownership of these concerns the glass company was enabled to ship glassware from Alton to California at a rate of $20 a car less than that paid by its competitors.

The full bench of the Supreme Court of Massachusetts has affirmed a decree of a single justice requiring the New York, New Haven & Hartford to part with all its holdings in the Worcester & Southbridge, Worcester & Blackstone Valley, Worcester & Webster, Webster & Dudley, the Berkshire and the Springfield Street Railway companies before July 1, 1909. The proceeding against the road was brought in 1906 by the Attorney-General of the state. The road said that it had doubt as to the meaning of the decree and wanted the court to set out more clearly and unmistakably what it could do and could not do. The full bench can find no reason for any doubt on the part of the road as to the meaning and intent of the order. A New Haven despatch says that the road expected the decision, and it is not regarded as changing in any material aspect the situation. The question now is whether or not during the legal proceedings the controlling interest in the electric lines has been legally disposed of. Since the stockholders' meeting last October the controlling common stock has been, with a single exception, sold to persons entirely disconnected with the company, either officially or in any other relationship whatever. The only official connection remaining, it is asserted, is in the fact that President Mellen remains one of the trustees of the Investment & Security Company. The New England Navigation Company holds as a creditor certain notes of the Investment & Security Company.

Judge Anderson, of the federal court, who is presiding in the second trial of the case of the government against the Standard Oil Company of Indiana for the alleged acceptance of rebates from the Chicago & Alton, indicated informally on

February 25 that on the evidence introduced at the previous trial he would rule that the defendant could not be convicted of more than 36 offenses, this being the total number of settlements made on the basis of the alleged illegal rates. Judge Anderson hinted that if the question were a new one which had not before been passed on he would give very serious consideration to the contention of counsel for the Standard Oil Company that there had been but one offense, which continued throughout the entire time that the alleged illegal rates were in effect; but that he understood from the decision of the Circuit Court of Appeals in the case that it considered the number of offenses to be the number of settlements that were made. Counsel for the Standard Oil Company previously attacked the venire called from which to select a jury, on the ground that it was composed almost entirely of farmers. Judge Anderson held that the point was well taken and ordered a new venire to be drawn. If Judge Anderson's formal ruling shall be the same as his informal ruling regarding the number of offenses, the maximum aggregate fine that can be imposed, if the Standard Oil Company shall be found guilty, will be $720,000, instead of $29,240,000, the aggregate fine imposed by Judge Landis at the former trial.

Hearing in Southwestern Rate Case.

The taking of testimony in the Southwestern rate case was finished by Commissioners Harlan and Clark of the Interstate Commerce Commission at St. Louis on February 25.

W. G. Van Vleck, Second Vice-President of the Galveston, Harrisburg & San Antonio and the Texas & New Orleans, stated that since the Texas Commission had valued these two roads at $18,000 a mile there had been an increase of over 100 per cent. in their value by reason of betterments and seasoning. He estimated the present value of the properties at $45,000 a mile. He said that it cost the two roads $35,000 to comply with the Texas law requiring electric headlights; that the state full crew law cost $25,000 a year; that the 8-hour law cost $10,000 a year and the 16-hour law $5,000 a year.

T. J. Freeman, Receiver and General Manager of the International & Great Northern, said that the train loads on this line had been reduced and the speed of freight trains increased. This had increased operating expenses but had also resulted in better service to shippers. It enables the Texas jobber to reduce the stock he carries because he knows that in 3½ days he can get a shipment from St. Louis. The increase in rates would result in the railways adopting a more liberal policy and in installing industrial tracks which would also benefit shippers.

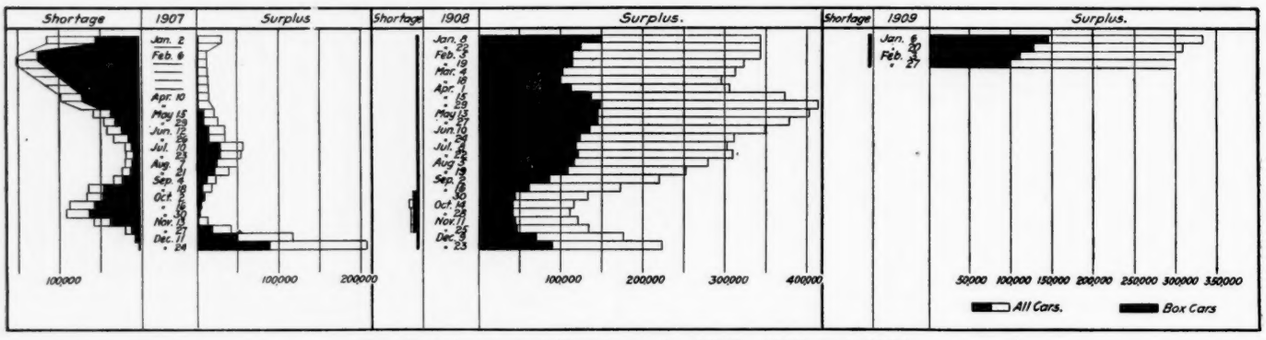
A. W. Houston, Counsel for the San Antonio & Arkansas Pass, submitted statistical tables showing that the increase in rates if applied to the tonnage carried in 1908, would increase the revenue of his road less than $27,000.

L. J. Storey, a member of the Texas Railroad Commission, was examined regarding the method used by the Texas Commission in making its valuation of railways. He said that the "unearned increment" in the real estate of Texas railways was not considered in the valuation. He admitted that "if the present estimated value of the real estate used for right-of-way and terminals were considered in making the valuation of the railway properties not a single railway in Texas would be earning a return on its valuation." He defended the method of valuation used on the ground that the influx of population caused the increase in the value of railway real estate, and that therefore the public should benefit by it through low rates, not the railways through high rates.

Car Surpluses and Shortages.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting bulletin No. 41 A, giving a summary of car surpluses and shortages by groups from December 24, 1907, to February 17, 1909, says:

"The surplus taken as a whole is practically unchanged since the last report, the total for this period being 301,441, a decrease of 130 cars. The figures by classes, however, show considerable change. There is a decrease of 12,120 in the number of surplus box and an increase of 12,497 in coal and gondola cars. Flat cars are evidently more in demand, as there is a decrease of 2,197 in the surplus of this class. Group 2 (Eastern) and 3 (Middle), comprising the principal coal roads, show the greatest increases, while group 6 (Northwestern) shows the largest decrease in box and total cars."



Car Surpluses and Shortages in 1907, 1908 and 1909.

Car Surpluses and Shortages, from December 24, 1907, to February 17, 1909, Inclusive.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
February 17, 1909	159	98,512	23,924	135,208	43,797	301,441	266	97	11	96	470
February 3, 1909	165	110,632	26,121	122,711	42,107	301,571	97	31	49	111	288
January 20, 1909	162	127,204	26,723	116,680	41,057	311,664	163	21	139	35	358
January 6, 1909	156	146,255	25,383	117,686	43,695	333,019	170	202	120	14	506
December 23, 1908	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
December 9, 1908	161	67,550	15,336	58,816	33,941	175,643	1,134	73	276	196	1,679
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249
January 22, 1908	161	124,622	27,328	142,388	48,292	342,580	392	132	79	135	738
December 24, 1907	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265	724

REPORTS OF REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1909.

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses					Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance Way and structures.	Maintenance Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	143	$91,802	$35,193	$137,629	$23,083	$25,147	$3,538	$45,198	$5,245	$102,211	$35,418	.....	$4,800	$30,618	$4,890
Bangor & Aroostook	515	196,625	35,322	243,955	41,544	29,828	3,798	77,981	11,344	164,495	79,460	.....	1,500	77,960	55,038
Buffalo, Rochester & Pittsburg	568	428,367	60,993	501,785	38,278	131,661	8,310	174,421	13,685	366,355	135,430	$141	15,000	120,571	30,528
Central of New England	294	151,277	21,531	185,375	23,044	23,504	1,666	83,921	4,415	136,550	48,825	.....	5,600	43,225	42,893
Chicago & Northwestern	7,635	3,047,297	1,151,077	4,656,739	466,759	575,159	103,746	2,098,330	95,888	3,339,882	1,316,857	7,836*	230,000	1,079,021	‡159,463
Chicago, Burlington & Quincy	9,023	3,866,164	1,391,673	5,807,989	459,821	1,151,998	121,650	2,105,690	168,131	4,007,290	1,800,699	13,120*	212,600	1,574,979	15,997
Chicago, Lake Shore & Eastern	630	259,208	.....	286,509	23,827	77,267	1,079	109,654	5,172	217,000	69,509	.....	3,000	66,509	8,870
Chicago, St. Paul, Minn. & Omaha	1,739	702,398	311,399	1,088,819	73,264	123,858	22,534	437,673	35,830	693,159	395,660	143*	53,008	342,509	11,537
Cleveland, Akron & Columbus	210	98,031	33,498	148,380	15,125	34,205	2,549	55,325	3,464	110,668	37,712	.....	5,000	32,712	6,918
Cumberland Valley	162	152,037	39,778	202,217	20,020	22,763	3,841	65,959	4,705	117,288	84,929	.....	3,713	81,821	11,915
Delaware, Lackawanna & Western	893	1,965,267	465,216	2,609,880	146,800	390,386	44,368	802,301	57,518	1,441,373	1,168,507	20,553	98,400	1,090,660	185,523
Elgin, Joliet & Eastern	239	179,550	31	184,431	18,093	25,021	2,793	73,201	7,218	126,326	58,105	.....	9,500	48,605	162
Florida East Coast	584	125,236	128,039	298,551	32,926	38,409	5,622	112,956	8,912	198,825	99,726	.....	11,000	88,726	5,056
Grand Rapids & Indiana	592	227,126	93,102	343,046	45,661	59,174	10,092	156,024	14,329	285,280	57,766	446*	20,749	36,571	21,411
Gulf & Ship Island	307	128,378	28,285	168,544	35,597	25,001	1,729	55,157	7,795	125,279	43,265	.....	5,850	37,415	13,487
Kansas City Southern	827	505,701	102,962	672,029	70,523	83,985	23,943	232,396	28,524	439,371	232,658	.....	25,581	207,077	38,482
Lehigh Valley	1,446	2,195,353	248,425	2,540,278	295,803	465,035	71,017	824,260	53,350	1,709,465	830,813	15,971*	94,600	720,242	65,332
Louisiana Western	198	114,145	48,896	172,252	17,504	20,580	5,908	44,978	7,488	96,458	75,794	866	5,000	71,660	‡4,248
Louisville & Nashville	4,388	2,699,532	807,853	3,754,769	375,330	710,609	85,055	1,256,426	83,824	2,511,244	1,243,525	23,866*	112,700	1,106,959	621,069
Maine Central	931	394,554	152,643	590,754	65,346	97,080	5,989	263,594	23,080	455,089	135,665	268	31,962	103,971	‡884
Morgan's La. & Tex. R.R. & S.S. Co.	351	251,417	93,584	376,525	86,238	41,530	10,366	139,303	13,643	291,080	85,445	1,725	16,000	71,170	‡88,089
New Orleans & North Eastern	196	221,540	46,996	287,668	25,081	43,958	7,507	96,373	12,306	185,225	102,443	.....	8,000	94,443	47,637
New York, New Haven & Hartford	2,000	1,991,696	1,687,333	4,055,890	480,072	485,041	19,732	1,962,416	100,101	3,047,362	1,008,528	59,371	295,000	772,899	644,534
New York, Philadelphia & Norfolk	112	169,653	27,315	213,763	25,606	41,738	3,004	84,563	8,665	163,576	50,187	.....	6,250	43,937	20,412
Norfolk & Southern	582	137,401	46,008	195,890	13,729	17,768	4,226	61,135	12,469	109,327	86,563	753*	5,200	80,610	51,833
Northern Central	462	660,133	144,229	865,660	131,899	216,412	11,193	440,327	18,540	818,371	47,289	320	19,514	28,095	‡86,520
Northern Pacific	5,674	2,835,667	1,026,490	4,147,390	464,006	651,185	62,360	1,677,255	122,309	2,977,115	1,170,275	16,338	157,601	1,029,012	‡499,164
Pennsylvania Co.	1,416	2,059,721	515,770	2,889,374	418,702	529,114	67,184	1,217,414	71,491	2,303,905	585,469	3,595*	147,460	434,414	129,218
Pennsylvania R.R.	4,048	7,917,382	2,140,058	10,891,952	1,377,907	2,400,157	144,389	4,126,776	279,961	8,329,190	2,562,762	32,553*	174,339	2,355,870	283,008
Phila., Baltimore & Washington	716	559,601	525,771	1,260,829	200,093	272,998	19,658	577,696	27,500	1,097,944	162,885	.....	31,142	131,743	‡3,658
Pittsburgh, Cin., Chicago & St. Louis	1,472	1,682,302	528,534	2,533,810	346,951	462,974	65,718	995,583	53,080	1,924,306	609,504	633*	114,160	494,711	69,689
Vandalia	829	423,782	164,974	668,559	78,530	121,060	21,556	299,844	17,242	538,232	130,327	.....	24,365	105,962	‡11,463
Vicksburg, Shreveport & Pacific	171	75,008	38,681	122,535	27,626	21,791	3,582	38,904	4,308	96,211	26,324	.....	6,000	20,324	7,755
Virginia & South Western	184	89,386	11,042	103,401	9,023	23,245	886	36,654	4,305	74,113	29,288	.....	3,850	25,438	15,380
West Jersey & Seashore	363	102,069	145,501	273,240	73,192	70,843	6,719	158,602	7,857	317,213	43,973*	1,528	17,112	59,557†	‡36,380
Wisconsin Central	1,131	416,439	97,978	550,976	47,778	90,251	25,610	243,734	20,429	427,802	123,174	94*	29,768	93,312	8,433

SEVEN MONTHS OF FISCAL YEAR.

Alabama & Vicksburg	143	$593,143	$276,777	$935,888	$148,417	$192,099	$22,945	$303,821	$34,744	$702,026	$233,862	.....	$28,720	$205,142	‡$1,474
Bangor & Aroostook	515	1,209,598	350,061	1,640,338	307,598	193,605	20,629	495,911	73,227	1,090,970	549,368	.....	10,500	538,868	248,147
Buffalo, Rochester & Pittsburg	568	3,508,844	547,535	4,234,084	557,826	991,506	58,344	1,266,795	97,495	2,971,966	1,262,118	$404	105,000	1,157,522	‡206,354
Central of New England	294	1,156,239	205,323	1,445,056	246,455	147,507	11,699	501,389	20,857	927,907	517,149	.....	39,200	477,949	275,066
Chicago & Northwestern	7,635	26,275,061	10,579,750	39,989,868	4,773,934	4,391,852	659,229	14,585,159	644,073	25,054,247	14,935,621	19,002	1,610,000	13,344,623	1,194,001
Chicago, Burlington & Quincy	9,023	31,313,039	12,155,101	47,410,584	6,830,464	7,678,200	892,901	14,549,716	1,161,715	31,112,996	16,297,588	84,791*	1,488,200	14,724,597	‡91,095
Chicago, Lake Shore & Eastern	630	2,139,485	.....	2,335,559	194,535	529,830	7,729	748,785	44,091	1,524,970	810,589	.....	21,000	789,589	345,200
Chicago, St. Paul, Minn. & Omaha	1,739	5,156,369	2,526,669	8,226,558	979,028	850,231	151,619	2,925,481	210,165	5,116,524	3,110,034	3,887	370,825	2,743,096	40,105
Cleveland, Akron & Columbus	210	795,288	271,905	1,163,108	134,725	205,174	16,485	379,629	21,191	757,204	405,904	.....	45,222	360,682	‡24,338
Cumberland Valley	162	1,061,272	347,340	1,479,753	140,324	134,526	26,940	460,153	38,850	800,793	678,960	4,232	25,991	657,201	297,947
Delaware, Lackawanna & Western	893	14,555,018	4,046,113	19,836,179	1,971,773	2,571,381	331,049	5,473,731	387,967	10,735,901	9,100,278	155,890	602,400	8,653,768	‡84,200
Elgin, Joliet & Eastern	239	1,373,851	300	1,422,045	152,811	226,369	17,931	464,558	55,272	916,941	505,104	.....	66,500	438,604	59,461
Florida East Coast	584	690,551	465,764	1,356,697	291,584	277,811	34,433	592,010	60,283	1,256,122	100,575	.....	77,000	23,575	85,306
Grand Rapids & Indiana	592	1,560,626	996,176	2,754,951	299,873	380,296	72,703	1,061,690	94,853	1,909,415	845,536	412	147,387	698,561	‡36,616
Gulf & Ship Island	307	822,305	217,278	1,108,497	233,511	174,450	10,117	365,790	51,245	835,113	273,384	.....	27,959	245,425	‡7,091
Kansas City Southern	827	3,840,908	790,556	5,084,586	555,141	599,455	152,487	1,620,502	185,383	3,112,968	1,971,618	.....	195,561	1,776,057	‡1,157,040
Lehigh Valley	1,446	16,525,239	2,394,431	19,562,007	2,065,288	3,648,183	455,586	5,904,560	372,117	12,445,734	7,116,273	26,868*	626,200	6,463,205	9,180
Louisiana Western	198	768,476	312,055	1,139,295	107,968	139,056	32,697	313,649	46,540	639,910	499,385	3,362	35,727	467,020	2,982,721
Louisville & Nashville	4,388	19,430,136	6,103,777	27,204,395	3,008,211	4,722,464	575,576	8,650,981	549,830	17,507,061	9,697,333	90,076*	786,725	8,820,532	‡296,444
Maine Central	931	2,815,413	1,183,889	4,927,573	777,882	673,785	51,703	1,759,734	161,864	3,424,968	1,502,605	18,315	217,186	1,303,734	159,603
Morgan's La. & Tex. R.R. & S.S. Co.	351	2,082,979	604,444	2,868,780	510,063	298,285	58,353	1,038,650	86,947	1,992,298	876,482	9,585	113,115	772,952	54,697
New Orleans & North Eastern	196	1,350,314	325,113	1,791,773	172,295	329,643	51,301	595,763	73,697	1,222,699	569,074	.....	52,000	517,074	120,991
New York, New Haven & Hartford	2,000	15,192,334	13,698,232	31,706,686	3,953,440	3,737,307	167,458	13,285,621	645,343	21,789,169	9,917,517	740,276	2,012,000	8,645,793	‡74,364
New York, Philadelphia & Norfolk	112	1,292,978	229,835	1,635,585	137,413	293,005	21,899	598,989	76,520	1,127,826	507,759	.....	43,540	464,219	160,788
Norfolk & Southern	582	855,320	382,315	1,336,408	193,384	145,396	29,744	435,217	104,630	908,371	428,037	155*	44,400	383,482	‡302,232
Northern Central	462	5,142,224	1,200,977	6,741,083	490,907	1,464,753	86,877	3,007,995	135,593	5,186,125	1,554,958	5,047	136,602	1,423,403	‡663,511
Northern Pacific	5,674	29,031,023	10,418,983	41,792,565	4,482,526	4,753,453	482,886	11,900,548	640,333	22,259,746	19,532,819	329,889	1,760,048	18,102,760	70,753
Pennsylvania Co.	1,416	18,352,391	4,085,756	24,564,718	2,256,126	3,842,146	430,722	8,247,288	502,498	15,278,780	9,285,938	16,152*	1,065,898	8,203,888	‡2,007,458
Pennsylvania R.R.	4,048	58,440,749	17,222,513	81,159,171	8,777,537	15,663,694	1,060,248	28,614,961	1,978,742	56,095,182	25,063,989	155,657	1,220,375	23,999,271	‡116,386
Phila., Baltimore & Washington	716	4,588,394	4,012,583	9,667,103	1,173,603	1,688,626	146,667	3,988,120	199,916	7,196,932	2,470,171	.....	217,992	2,252,179	154,498
Pittsburgh, Cin., Chicago & St. Louis	1,472	12,796,192	4,187,725	19,196,212	2,067,603	3,297,840	426,466	6,668,550	393,280	12,853,739	6,342,473	4,359*	849,755	5,488,359	‡59,397
Vandalia	829	3,341,695	1,335,612	5,261,220	783,426	847,662	146,713	2,001,929	117,228	3,896,958	1,364,262	.....	178,557	1,185,705	50,366
Vicksburg, Shreveport & Pacific	171	478,616	294,661	834,050	141,453	168,766	23,486	252,899	29,398	616,002	218,048	.....	42,453	175,595	81,035
Virginia & South Western	184	625,187	88,593	738,372	79,552	127,583	6,230	219,787	26,746	459,898	278,474	.....	29,293	249,181	‡170,622
West Jersey & Seashore	363	872,972	2,031,027	3,064,885	441,380	402,027	76,699	1,255,280	54,453	2,229,839	835,046	52,608	119,787	767,867	‡33,370
Wisconsin Central	1,131	3,178,108	965,337	4,427,573	482,219	544,881	171,338	1,580,589	141,746	2,920,773	1,506,800	3,424	205,950	1,304,274	

*Deficit. †Loss. ‡Decrease.

Western Transit and Rutland Transit United.

The Western Transit Line and the Rutland Transit Line, controlled by the Rutland Railroad, have been consolidated, and the joint headquarters will be at Buffalo. The new arrangement eliminates Cleveland as a stopping point and the office there will be closed. Hereafter westbound boats will load 14 ft. at Ogdensburg, going to Buffalo for the balance of their cargo. The eastbound vessels will load 16 ft. at Chicago for Buffalo, lightering there to 14 ft. for the trip through the Welland canal and the river to Ogdensburg. Both lines have long been controlled by the New York Central.

Traffic Club of Chicago.

The Traffic Club of Chicago on February 25 increased its initiation fee for all members to $10, the annual dues for resident members to $25 and the annual dues for non-resident members to $12.50. The committee appointed to seek permanent club rooms stated that rooms probably would be secured by April 1. The annual meeting of the club and election of officers will be held on March 30. The nominating committee has nominated for President, W. M. Hopkins; for First Vice-President, Fred Zimmerman; Second Vice-President, J. Charles Maddison; Third Vice-President, W. H. Johnson; Secretary, John T. Stockton; Treasurer, John H. Grace; Directors for two years, Frank T. Bentley, D. W. Cooke and F. B. Montgomery.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

E. C. Noble has been appointed the General Claim Agent of the Texas & New Orleans.

James Steuart Mackie, Secretary of the Colorado & Southern, has been elected the Secretary of the Chesapeake & Ohio, with office at New York.

John S. Rockwell, Real Estate and Tax Agent in the state of New York of the Buffalo, Rochester & Pittsburgh, has been appointed the General Agent, with office at Rochester, N. Y., and he will have charge of tax assessments, real estate and personal injury claims.

The following officers of the La Fayette Railroad were elected at a meeting of the Board on February 23: President, H. T. Kincaid, Dayton, Ohio; First Vice-President and General Manager, J. A. Kauffman, La Fayette, Ga.; Secretary and Treasurer, Col. T. J. Kauffman, Dayton, Ohio; Second Vice-President and General Counsel, R. M. W. Glenn, La Fayette, Ga.; W. D. Morrison, Assistant Secretary, and S. A. Hunt, Jr., Assistant Treasurer.

The Dakota, Kansas & Gulf has elected the following officers: President, W. H. Mitchell, Beloit, Kan.; First Vice-President, N. R. Holmes, Troy, N. Y.; Second Vice-President, W. H. Roe, Kearney, Neb.; Third Vice-President, C. B. Winegar, Lebanon, Kan.; Fourth Vice-President, J. B. Holmes, Troy, N. Y.; Secretary, George N. Nay, Sandy Hill, N. Y.; Assistant Secretary, W. W. Dilworth, Beloit; Second Assistant Secretary, C. W. Kibler, Kearney; Treasurer, F. T. Locke, New York; Assistant Treasurer, A. T. Rodgers, Beloit; Second Assistant Treasurer, A. U. Dann, Kearney; General Attorney, F. T. Burnham, Kansas City, Mo.

Operating Officers.

W. E. Becker has been appointed the Superintendent of the Southern Indiana and the Chicago Southern, with office at Terre Haute, Ind., succeeding M. E. Sebree, resigned.

A. W. McLimont, Electrical Engineer of the New York Public Service Commission, First district, has been appointed the General Manager of the Chicago & Milwaukee Electric.

W. R. Beauprie, Superintendent of the Montgomery district of the Atlantic Coast Line, has been appointed the General Manager of the Atlanta & St. Andrews Bay, with office at Dothan, Ala.

S. E. Dillon has been appointed the Superintendent and Local Treasurer of the Little Rock & Hot Springs Western, with office at Little Rock, Ark., succeeding H. E. Martin, resigned to engage in other business.

W. C. McKeown, Assistant Superintendent of the Wyoming division of the Union Pacific, has been appointed a Superintendent, with office at Cheyenne, Wyo., succeeding H. L. Anderson, resigned on account of ill health.

T. F. Brennan, Superintendent of Transportation of the Buffalo, Rochester & Pittsburgh, has been appointed the General Superintendent, with office at Rochester, N. Y., and his former office has been abolished. J. E. Burnes has been appointed the Superintendent of Car Service, with office at Rochester.

John C. Dailey has been appointed the General Superintendent of the Denver & Rio Grande, with office at Salt Lake City, Utah, as previously announced in these columns. He was born on January 12, 1864, at Lebanon, Ohio, and began railway work in 1884 as an agent of the Illinois Central. In 1887 he was appointed Train Despatcher, and in 1892 Chief Train Despatcher. In 1893 he was appointed Trainmaster, and in 1898 was made Superintendent. On February 15, 1908, he was appointed the General Superintendent of the International & Great Northern, which position he held until his appointment as the General Superintendent of the Denver & Rio Grande, on February 1, 1909.

Hugh M. Taylor, who has been appointed Assistant General Manager of the National Railways of Mexico, was born in 1870 at Montgomery, Ala. After graduating from the Alabama Technical Institute, he began railway work in 1889 on the Birmingham Mineral, now part of the Louisville & Nashville, as masonry inspector. He later became draftsman, then Assistant Engineer, and still later Resident Engineer. His work with the Louisville & Nashville included the erection of the Coasa river bridge between Sylacauga, Ala., and Calera in 1890 and 1891. In September, 1891, he became Supervisor of the Mexican National, and was successively brakeman, Assistant Engineer, yardmaster, conductor, Trainmaster and Superintendent. He was then appointed Superintendent of Construction in charge of building the line from Huchuetoca to Gonzalez, about 161 miles. After this line was completed Mr. Taylor was appointed General Manager of the Interoceanic of Mexico, and on May 20, 1907, was appointed Assistant General Manager of the National Lines of Mexico, in charge of engineering and maintenance, which position he held until his authority was extended over the lines of the National Railways of Mexico.

Traffic Officers.

George S. Bassett, Jr., has been appointed Traveling Freight Agent of the Michigan Central at Pittsburgh, Pa.

O'Donnell Iselin has been appointed a Traveling Passenger Agent of the Buffalo, Rochester & Pittsburgh, with office at Rochester, N. Y.

A. C. Baker has been appointed a Passenger Agent of the Chicago Great Western, with office at Chicago, succeeding R. H. McCurdy, resigned.

L. L. Korn has been appointed a Freight Traffic Agent of the Atchison, Topeka & Santa Fe, with office at Indianapolis, Ind., succeeding R. M. Jenks, resigned to go with another road.

J. T. Crutchfield, Commercial Agent of the Atlanta, Birmingham & Atlantic, has been appointed the General Western Agent of the Texas City Steamship Co., with office in the American Trust building, Chicago.

Edwin F. Adams, chief clerk in the passenger department of the Gulf, Colorado & Santa Fe, has been appointed the Assistant General Passenger Agent, with office at Galveston, Tex. This is a new position.

Charles E. Perkins, Assistant General Freight Agent of the Kansas City Southern, has been appointed an Assistant General Freight Agent of the St. Louis, Iron Mountain & Southern, with office at St. Louis, Mo.

Osgood Packard has been appointed a Traveling Passenger Agent of the Boston & Albany, with office at Boston, Mass., succeeding C. E. Colony, who has been appointed a City Passenger and Ticket Agent, with office at Boston.

A. S. Haines, District Passenger Agent of the Illinois Central, at Nashville, Tenn., has been appointed District Passenger Agent at Jackson, Miss., and James P. Brown, Traveling Passenger Agent at Jackson, has been transferred to Nashville.

Frank W. Teasdale has been appointed a Commercial Agent in charge of freight traffic in the city of Minneapolis, Minn., and suburban points, of the Chicago, St. Paul, Minneapolis & Omaha, with office at Minneapolis, succeeding W. Wade Wilcox, resigned to engage in other business.

Stanley H. Johnson, whose appointment as the Assistant Freight Traffic Manager of the Chicago, Rock Island & Pacific has previously been announced in these columns, was born on February 22, 1872, at Bunker Hill, Ill. After a High School education at St. Louis, Mo., he became connected with the Southern Interstate Association, at St. Louis. Later he was employed as stenographer in the Freight Traffic department of the Missouri Pacific at St. Louis, and from here he went for a time to the East Tennessee, Virginia & Georgia, now a part of the Southern, at Knoxville, Tenn. He next was associated with the Chesapeake, Ohio & South-western, now a part of the Illinois Central, at Louisville, Ky. Early in 1894 he went with the Southwestern Freight Bureau, at St. Louis, remaining with that organization about eight years and occupying various positions up to that of bureau secretary. In 1902 he was appointed chief clerk to the Third Vice-President and Traffic Manager of the Chicago, Rock Island & Pacific, and in 1904 he was made General Freight Agent at Little Rock, Ark. In 1906 he was appointed an Assistant General Freight Agent, which position he held until his recent appointment.

Engineering and Rolling Stock Officers.

C. B. Smyth, Assistant Mechanical Engineer of the Union Pacific, has resigned and has been appointed the Superintendent of the McKeen Motor Car Co., Omaha, Neb.

C. A. Christofferson, Signal Engineer of the Chicago Great Western, has been appointed the Signal Engineer of the Northern Pacific, with office at St. Paul, Minn.

T. A. Lawes has been appointed the Master Mechanic of the Southern Indiana and the Chicago Southern, with office at Bedford, Ind., succeeding G. A. Gallagher, resigned.

A. M. Kinsman, Engineer of Construction of the Baltimore & Ohio, has been appointed the Chief Engineer, with office at Baltimore, Md., succeeding D. D. Carothers, deceased.

W. I. Bell has been appointed an Assistant Supervisor of Signals of the Eastern Pennsylvania division of the Pennsylvania, succeeding George E. McFarland, promoted.

H. R. Klepinger has been appointed the Chief Engineer of the La Fayette Railroad, with office at Dayton, Ohio. W. T. Sherman has been appointed the Assistant Chief Engineer.

G. E. Johnson has been appointed the Master Mechanic of the Wymore division of the Chicago, Burlington & Quincy, with office at Wymore, Neb., succeeding A. B. Pirie, assigned to other duties.

W. B. Embury has been appointed the Master Mechanic of the Oklahoma & Pan Handle divisions of the Chicago, Rock Island & Pacific, with office at Chickasha, Okla., succeeding W. J. Monroe, resigned.

A. S. Greig, Assistant to the Chairman of the Executive Committee of the Chicago, Rock Island & Pacific, St. Louis & San Francisco, Chicago & Eastern Illinois and the Evansville & Terre Haute, and Edward S. Moore, Second Assistant to the President of the Rock Island Lines, will hereafter in addition to their present duties, act as a Committee on Standardization of all these lines, with office at Chicago. Mr. Greig will be Chairman of the Committee.

Purchasing Officers.

Roy S. Parker has been appointed the General Storekeeper of the Kansas City, Mexico & Orient, with temporary office at Fairview, Okla.

OBITUARY.

J. V. Key, Superintendent of Construction of the Eastern of New Mexico, died from heart failure at Albuquerque, N. Mex., on February 26. He had had charge of the work on the Belen cut-off of the Atchison, Topeka & Santa Fe and had been with the Santa Fe for 18 years.

George R. Hough, a veteran conductor of the Wabash, died at his home at Clayton, Ill., Feb. 18, at the age of 74. Mr. Hough had been in continuous service on the Wabash for 52 years and was the oldest man in length of service on the entire system. He served as passenger conductor for 32 years between Keokuk and Bluffs.

W. H. Whalen, Purchasing Agent of the General Rubber Co., New York died on March 2 at his home in New York after an illness of about a year. He was 58, and at one time was Assistant Purchasing Agent of the Chicago, Rock Island & Pacific, and became Purchasing Agent of the Delaware, Lackawanna & Western in 1899, and six years later became Purchasing Agent of the General Rubber Co.

Henry C. Hope, Superintendent of Telegraph and Signals of the Chicago, St. Paul, Minneapolis & Omaha, died from apoplexy on February 26, at St. Paul, Minn. He was born June 19, 1850, at Rockford, Ill. He began railway work in 1873 as operator and despatcher of the Chicago, Milwaukee & St. Paul, at Milwaukee, Wis. He was appointed to the position he held at the time of his death, on November 1, 1880.

W. H. Tilford, Vice-President of the Standard Oil Co., died in New York on March 2. Mr. Tilford was 59 years old. He began work in the oil business, the firm of which he became a partner being later merged into the Standard Oil Co. In 1878 he went to the Pacific coast, organizing subsidiaries of the company and, particularly, organizing the Standard Oil's transportation lines along the Pacific coast and across the Pacific. After returning to New York, most of his time was taken up in arranging similar transportation matters for the parent company. He was later made Treasurer and, finally, a Vice-President.

Clement Rolla Glass, formerly in the engineering departments of the Southern Pacific and the Union Pacific, and at the time of his death General Manager of the Andes Tin Co., La Paz, Bolivia, S. A., accidentally shot himself in Buenos Ayres on January 2, and died almost instantly. He was born in Martinez, Cal., and received his education at the University of California and at the San Jose University. He was for a time Deputy United States Surveyor of Nevada and was also in the Geological Service. After spending some time in Alaska with various mining companies he went to South America and was appointed Chief Engineer of the Consolidated Copper Mines of Corocoro. Later he was made Manager of the Inca Rubber Co. of Peru, where he remained until his connection with the Andes Tin Co. His exceptional ability as a mining engineer did much toward placing the mining work of Bolivia on a systematic basis. He was 41 years of age.

H. A. Schwanecke, Vice-President of the Pittsburgh, Binghamton & Eastern, died at his home in Marshall, Ill., on February 21 from a complication of asthma and other diseases. Mr. Schwanecke was born at Hanover, Germany, in November, 1846. He graduated from Göttingen University with high honors in 1866, and came to America shortly after graduation. He began railway work as draftsman on the Philadelphia & Reading, and was later appointed Assistant Engineer of the Reading & Columbia, now part of the Philadelphia & Reading. Later he became Principal Construction Engineer of the Perkiomen Railway, and later became Principal Assistant Engineer in charge of location and construction of the Vandalia. Among other positions held by Mr. Schwanecke were the following: Principal Assistant Engineer of the Ashtabula, Youngstown & Pittsburgh; Chief Engineer of the Springfield & St. Louis; Chief Engineer of the Lake Erie & Western;

Chief Engineer and Superintendent of Construction of the Pittsburgh Junction Railway; Chief Engineer of the Foxburg Bridge Co. He also had a large private practice as consulting engineer, and had served on many important commissions in addition to his railway work.

Edwin Reynolds, who was President of the American Society of Mechanical Engineers in 1902, died at Milwaukee, Wis., on February 19. Mr. Reynolds was born in 1831 in Connecticut. After a public school education he went into a machinist's shop and served his apprenticeship. After working in different shops, he went to Aurora, Ind., becoming Superintendent of the shops of Stedman & Co. He returned to the East when the civil war crippled this business, and in 1867 went to the Corliss Steam Engine Co., Providence, R. I. He was made General Superintendent of these works in 1871. Six years later he went to Milwaukee as General Superintendent of the Reliance works of Edward P. Allis & Co. Soon after his connection with this concern he designed the Reynolds-Corliss engine and later introduced the first triple-expansion pumping engine, the cross compound hoisting engine for mining purposes and a number of other original designs in steam engine development that placed him high in the field of mechanical engineering. He was later instrumental in bringing about the organization of the Allis-Chalmers Co., which took in the Allis works and several others, becoming Second Vice-President and a Director of the new company. Mr. Reynolds was also President of the German-American Bank of Milwaukee, President of the West Allis Malleable Iron & Chain Belt Co., and was the first President of the National Metal Trades Association. He was also a member of many technical societies and clubs, and in 1885 was given the honorary degree of LL.D. by the University of Wisconsin.

Railroad Construction.

New Incorporations, Surveys, Etc.

Acme, Red River & Northern.—The name of this company has been changed to Quanah, Acme & Pacific Railway.

Asheville & East Tennessee.—This company is said to have started work on a line to be built from Asheville, N. C., north thence northeast via Weaverville, Mars Hill and Burnsville to Huntdale, on the Carolina, Clinchfield & Ohio, about 45 miles. Track laid from Asheville on about eight miles. R. S. Howland, General Manager, Asheville.

Billings & Cooke City (Electric).—According to press reports this company is building an electric line from Billings, Mont., southwest to Cooke, near the Yellowstone National Park, about 85 miles. George H. Savage, Secretary and Chief Engineer.

Brockville, Westport & Northwestern.—Application is being made to the Canadian parliament to extend the time for building this company's previously authorized lines.

Canadian Roads.—Application has been made by W. R. Clarke, of Kansas City, Mo., and associates, to the Alberta legislature for a charter to build a line from Edmonton, Alb., north via Lac la Biche to Fort McMurray, on the upper Athabasca river, about 250 miles.

Cleveland, Southwestern & Columbus (Electric).—This company has finished work on the connecting line from the main line at Seville, Ohio, southwest via Ashland to Mansfield, 42 miles, where connection is made with its western lines.

Coal & Coke.—An officer writes, regarding the reports that this company will shortly let contract for building a branch from Gassaway, W. Va., south to the mouth of Wolf creek, that no definite action has yet been taken for the construction of this branch, and it is undecided when anything will be done.

Crow's Nest & Northern.—According to press reports this company will begin work this summer on a line for which surveys have been filed with the British Columbia government, from Crow's Nest, B. C., to coal fields at Crown, 12 miles. J. A. Williams, President, and C. O. Diffenderfer, Chief Engineer, Spokane, Wash. (Dec. 4, p. 1500.)

Denver, Northwestern & Pacific.—The extension from Yampa, Colo., north to Steamboat Springs, 29 miles, has been opened for operation. (Jan. 1, p. 36.)

Des Quinze & Blanche River.—This company is asking for an extension of time for building its authorized lines from Dyment, Ont., on the Temiskaming & Northern Ontario, to the mouth of the Des Quinze river, Quebec, thence to Des Quinze lake. The Bronson Company, Ottawa, who are chiefly interested in this railway, have contracts for construction.

Franklin & Clearfield.—See Lake Shore & Michigan Southern.

Grand Trunk Pacific.—Application is being made to the Canadian Parliament for an act empowering the company to build additional lines of railway as follows:

From a point on the main line west of Pembina Crossing, Alb., in a southwesterly direction to a point near the Embarras river, thence in a southerly direction toward the headwaters of the Little Pembina river, about 100 miles.

From a point on the main line along the Embarras river in a southwesterly direction towards the McLeod river, about 25 miles.

From a point on the authorized line between Calgary, Alb., and Coutts, in a southwesterly direction to McLeod, thence through the Pincher creek vicinity to the western boundary of Alberta, about 100 miles.

Authority is also being sought to issue bonds to the extent of $30,000 per mile.

The Railway Committee has reserved decision on the application of this company for an extension of time until June, 1911, to build 85 miles of the Kitimat branch in British Columbia. The right to build this branch was secured from the Pacific Northern & Ominica Railway, which was granted a charter in 1902 and carries a subsidy of $5,000 a mile.

Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction Co.—This company has applied for a grant of land under the waters of Cayuga lake, on which to construct an embankment to carry its proposed extension to be built across the northern end of the lake east to Geneva, N. Y. The embankment is to be about a mile long and cost between $180,000 and $200,000.

International & Great Northern.—Surveys are being made by this company at Taylor, Tex., for new switching yards and tracks adjoining the grounds for the site of the new roundhouse and machine shops in southwest Taylor.

Kansas City, Olathe, Ottawa & Iola.—Projected from Kansas City, southwest via Olathe and Ottawa, to Iola. An officer writes that during the past four years three complete surveys have been made for this line. The final location provides that no grade will be above 1 per cent. and no curve greater than 1 deg. Financial arrangements were made last October and the company is now ready to give the first division of 50 miles, between Iola and Ottawa, to the contractors.

Knoxville, Sevierville & Eastern.—Work is said to be under way on the first eight miles of this line projected from Knoxville, Tenn., southeast to Sevierville, 29 miles. Contract reported let to the Revilo Construction Co., of Knoxville. It is expected to have the entire line finished this year. W. A. Seymour, Chief Engineer, Knoxville. (July 17, p. 554.)

Kootenay & Crow's Nest.—This company is seeking a charter from the Alberta government for a line from Crowley, Alb., southeast to a point on the International boundary near Coutts.

La Fayette Railroad.—Surveys made for a line to connect La Fayette, Ga., with the Chattanooga Southern, about four miles. The company wants quotations on a 50,000-gal. water tank, complete with spout; an upright boiler and pump; 375 tons of 60-lb. rails and 90 tons of 56-lb. rails, with angle bars, bolts and spikes, and a 200 or 300 light electric plant complete. J. A. Kauffman, General Manager, La Fayette, Ga.

Lake Shore & Michigan Southern.—An officer writes that track on the Franklin & Clearfield is laid from Brookville, Pa., to Welch Run, about 10 miles, and the Welch Run bridge is about 50 per cent. completed. Track will reach Brookville about July next.

LONDON & NORTH WESTERN.—Application made to incorporate this company to build from London, Ont., west to Sarnia, passing through the townships of Lobo, East Williams, Adelaide, Warwick, Plympton and Sarnia; also from London to a point on Lake Huron, passing through the townships of East Williams, West Williams, McGillivray, Stephen, Hay, Stanley and Goderich, and with power to build branch lines not longer than 15 miles, and not to extend beyond the limits of the counties of Middlesex, Lambton or Huron. Authority is also being sought to build and operate telegraph and telephone lines, etc., such work to be declared for the general advantage of Canada. Ivey & Dromgole, London, Ont., solicitors.

MARSHALL & EAST TEXAS.—Press reports from Marshall, Tex., indicate that negotiations with the city have been satisfactorily completed, and the building of the line to the south is now assured; also that contract was given to Scott & Sons, contractors, St. Louis, Mo., for 12 miles. (Feb. 19, p. 380.)

MISSOURI & NORTH ARKANSAS.—An officer writes that the main line has been completed from Neosho, Mo., to Helena, Ark., and the bridge over White river, consisting of a 300-ft. draw span and two 125-ft. spans with girder and trestle approach, has been completed. Connection will be made with the St. L., I. M. & S., the Y. & M. V. and the I. C. at Helena. Sixty miles of the new line are in the Ozark mountains. Regular train schedule went into effect on March 1.

MISSOURI, OKLAHOMA & GULF.—Work on the line from Lamar, Okla., south to Calvin, 17.1 miles, has been completed and the line opened for operation. (July 3, p. 457.)

MORGANTOWN & DUNKARD VALLEY (ELECTRIC).—At a recent meeting of the stockholders of this company steps were taken to issue at once $300,000 of bonds to cover the cost of construction on 30 miles of line from Morgantown, W. Va., west to Wadestown, six miles north of Mannington. About four miles of the line has been graded. J. A. Miller, Chief Engineer, Morgantown.

NEW CASTLE & NEW WILMINGTON (ELECTRIC).—The Mercer Construction Co., Mercer, Pa., has purchased the charter of this company, including the franchise in New Castle, Pa., and 11 miles of right of way between New Castle and New Wilmington. The line is projected north to Conneaut Lake via Greenville. The main line will be 44 miles long. F. P. Filer, President, Mercer; S. D. Downs, Vice-President, Greenville; L. W. Orr, Secretary and Treasurer, Mercer.

NORFOLK & WESTERN.—Directors of this company recently authorized the construction of seven miles of double track in West Virginia west of Iaeger, and 31 miles between the Ohio river and Columbus, Ohio, at congested points. This work, which is to be begun at once, will include considerable revision of lines and grades. The cost of the improvements will be about $1,225,000.

OCEAN SHORE.—An officer writes that the main line from San Francisco, Cal., south to Santa Cruz, which is to be 78 miles long, is now in operation from San Francisco south to Long Bridge, 38 miles, and from Santa Cruz, north to Scott creek, 14 miles, leaving a gap of about 26 miles on which grading is under way. This work is under contract to Lilly & Heins, and the Humboldt Contracting Co., of Santa Cruz; Graham-Nicholson Contracting & Engineering Co., of San Francisco, and the Ransome-Crummey Co., of Oakland. About eight miles is heavy bluff work, running about 200,000 cu. yds. a mile, and the balance is across open country where work will average about 20,000 cu. yds. a mile. The company has in operation 2½ miles of branch line and 6½ miles of commercial sidings. Nothing further has been done since surveys were made for the proposed branch to be built under the name of the Ocean Shore & Eastern from Santa Cruz, south east to Watsonville, 19 miles, and from that place under the name of the San Juan Pacific to Hollister, 25 miles. Part of the latter is in operation. Surveys were also made for an additional 200 miles to be built under the name of the San Joaquin Valley from Hollister to Coalings. (Dec. 4, p. 1501.)

OCEAN SHORE & EASTERN.—See Ocean Shore.

PITTSBURGH, MORGANTOWN & GRAFTON.—Surveys are soon to be started by this company for an electric line to be built from the Pittsburgh, Pa., district, west to points in West Virginia. W. E. Hildebrand, the principal promoter, is quoted as saying that application will shortly be made for a charter, and that the first construction work will be carried out from Washington, Pa., to Marianna, where the mines of the Pittsburgh-Buffalo Coal Co. are located. James Bryan, of the Pittsburgh, Harmony, Butler & New Castle Railway will be the engineer in charge.

QUANAH, ACME & PACIFIC.—See Acme, Red River & Northern.

SAN JOAQUIN VALLEY.—See Ocean Shore.

SAN JUAN PACIFIC.—See Ocean Shore.

SAPULPA & INTERURBAN.—This company is said to have been organized in Oklahoma to build a line from Sapulpa, Okla., southeast via Kiefer to Glenpool, on the Midland Valley Railroad, 10 miles. Five miles additional are to be built at and near Sapulpa, also a line north to new oil fields at Taneha. Contracts are to be let for grading and bridging. The company will erect the overhead work with its own forces. H. E. Clark, President, Glen Campbell, Pa., and D. W. Patton, Chief Engineer, Sapulpa.

SIOUX CITY & SPIRIT LAKE (ELECTRIC).—An officer writes that franchises have been granted by the towns of Le Mars, Paullina, Primghar, Hartley and Spirit Lake. It is expected to begin work early this spring and finish the entire line this year. The projected route is from Sioux City, Iowa, northeast to Spirit Lake, 108 miles. The maximum grade will be less than 1 per cent., with 3 degs. curvature outside of the towns. Contract let to the Westinghouse, Church, Kerr & Co., New York, to build the line. F. Patch, President, and L. F. Wakefield, Chief Engineer, 209 American block, Sioux City. (Oct. 16, p. 1177.)

SOUTHERN PACIFIC.—An officer of the Texas & New Orleans writes that grading is about finished on the extension from Gallatin, Tex., south to Rusk, nine miles. Track laid on two miles. The Suderman-Dolson Co., Galveston, Tex., are the contractors. (Sept. 18, p. 982.)

Building second track between Rockland, Cal., and Colfax, about 30 miles. This second track is on new center line with a maximum grade of 1.5 per cent. compensated.

The San Ramon branch has been extended from San Ramon, Cal., south to Radum, 11 miles.

TENNESSEE COAL, IRON & TIMBER COMPANY.—According to press reports this company, incorporated in Maine with $1,500,000 capital, owns over 50,000 acres of mineral and timber lands in Cumberland and Morgan counties, Tenn. Plans made to build a short railway to connect with the Southern Railway and the Cincinnati, New Orleans & Texas Pacific. The directors include former Governor Curtis Guild, Jr., G. Bolster and W. Whitcomb, all of Boston, Mass.; W. A. Henderson, of Washington, D. C.; S. W. McCall, of Winchester, Mass., and S. Dixon, of Macdonald, W. Va.

TEXAS & NEW ORLEANS.—See Southern Pacific.

TEXAS ROADS.—A charter has been granted in Texas to the company organized by L. E. Walker, J. Lake and others, of Marshall, Tex., to build a line from Marshall south to Port Arthur, about 200 miles. (Oct. 30, p. 1276.)

TUXPAN & FURBERO.—An officer writes that this company is building a line from the Port of Tuxpan, in the state of Vera Cruz, Mex., to Furbero, in the same state, 54 miles. Track has been laid from Tuxpan to Cazones, 20 miles. The work includes one 150-ft. steel bridge. About 1,500 men are now at work and it is expected the line will be finished by June. The company is also putting in a 6-in. pipe line, two pumping stations, also tanks to be finished by July, and expects to begin delivering oil at the Port of Tuxpan in August. Percy N. Furfer, President of the Oil Fields of Mexico Company, and A. C. Payne, General Manager, Mexico City.

VALDEZ & YUKON.—Press reports indicate that a contract has been let for the first 34 miles of this road from Valdez to the Copper river and that construction work will be started not later than May 1.

WASHINGTON, POTOMAC & CHESAPEAKE.—Press reports say that plans are being made for an extension from the present southern terminus at Mechanicsville, Md., southeast to Esperanza, on the St. Mary's side of Drum Point Harbor, 20 miles.

Railroad Financial News.

Baltimore & Ohio.—Principal and interest of the $6,000,000 one-year 5 per cent. notes due March 1, and the $3,660,000 one-year 5 per cent. notes due March 2, were paid.

See Cincinnati, Hamilton & Dayton.

Canadian Northern.—See Duluth, Rainy Lake & Winnipeg.

Canadian Pacific.—The company has sold $3,984,000 common stock, making the total amount outstanding $150,000,000.

President Shaughnessy is quoted as saying that the company has bought "$5,000,000 worth" of Canadian government 3½ per cent. debentures.

Chesapeake & Ohio.—Frank Trumbull has become chairman of the board of directors, and James H. Dooley has been elected a director, succeeding H. T. Wickham. Edwin Hawley, Frank A. Vanderlip, John W. Castles, Frank Trumbull and President George W. Stevens have been appointed an executive committee.

Chicago, Milwaukee & Puget Sound.—See Union Pacific.

Chicago, Rock Island & Pacific.—Speyer & Co., New York, have bought $3,486,000 first and refunding mortgage bonds maturing April 1, 1934.

Chicago Southern.—The security holders' protective committee, consisting of C. D. Smithers, A. G. Hodenpyl, M. B. Johnson, E. K. Boisot and J. E. Blunt, Jr., with Silas W. Howland, Secretary, 24 Broad street, New York, ask the deposit, prior to March 15, of outstanding first mortgage bonds, collateral bonds and syndicate subscription certificates.

Cincinnati, Hamilton & Dayton.—The following is the financial plan of the Cincinnati, Hamilton & Dayton:

The 4 per cent. notes maturing 1913 will be guaranteed principal and interest by the Baltimore & Ohio, and $11,000,000 Pere Marquette common stock, which is held as collateral, will be relinquished.

Holders of the 4½ per cent. notes maturing 1909 will be asked to waive three and one-half years' interest in default.

They will receive in exchange either (1) Baltimore & Ohio 4 per cent. bonds, with coupons detached up to 1915, or (2) an offer of $60 in cash, or (3) some equivalent of this amount maturing in two years' time.

J. P. Morgan & Co. give the Baltimore & Ohio the option to purchase their $8,000,000 Cincinnati, Hamilton & Dayton common stock at 160 in five years. This was the original price J. P. Morgan & Co. paid for the stock. If the B. & O. fails to exercise this option, it will buy the stock in any case after an appraisal at the end of the five-year period.

J. P. Morgan & Co. will retain the $11,000,000 Pere Marquette common under terms of the deal with the 4 per cent. note holders.

Duluth, Rainy Lake & Winnipeg.—The Canadian Northern, it is said, owns the entire capital stock of the Duluth, Rainy Lake & Winnipeg, but has not assumed or guaranteed the bonds.

Erie.—The New York Public Service Commission, Second district, has granted some minor modifications of the order giving the Erie permission to issue $30,000,000 bonds, but it has refused to grant the request that the issue be allowed on the consent of 60 per cent. instead of 90 per cent. of the bondholders.

The time limit for the sale of bonds heretofore authorized is changed from August 1, 1909, to October 1, or such latter date as the commission may prescribe. (Feb. 19, page 346.)

Intercolonial Railway.—On apparently good authority, negotiations are reported pending between Sir Wilfrid Laurier, the Canadian Premier, and the Canadian Northern Railway for a lease of the Intercolonial Railway to the Canadian Northern, on a basis of approximately 2 per cent. on the outstanding Intercolonial securities, the rental to be increased in proportion to increases in earnings of the leased road.

New York, New Haven & Hartford.—See an item in regard to this company under Court News.

New York-Philadelphia Co. (Electric).—A majority of the company's securities has been deposited under the agreement of the protective committee, consisting of John A. Young, W. E. Scarritt and H. W. Whipple, with G. D. Bruce, 2 Rector street, New York, as Secretary. (R. G., March 6, 1908, p. 330.)

Southern Railway.—J. P. Morgan & Co., the First National Bank and the National City Bank, all of New York, are offering $21,333,000 Southern Railway development and general mortgage 4 per cent. (series A) bonds due 1956 at 79. The bankers will accept up to April 1, 1909, at 102½, in payment for the bonds, Southern Railway five-year 5 per cent. collateral bonds maturing April 1, 1909, and carrying the coupon due April 1, 1909. Including the present issue, the total amount of development and general mortgage bonds outstanding is $62,000,000. The mortgage securing the bonds will be, after April 1, a first lien on the following: 765 miles of line; on lease holds or trackage rights on line aggregating 1,085 miles; on the majority of stock of railways aggregating 475 miles; on stocks insuring perpetual right to use freight and passenger terminal properties in 16 cities in the South, and on all future acquisitions of lines built or paid for free from lien with the proceeds of the new bonds.

Stephensville North & South Texas.—A half interest has been sold to St. Louis interests, it is said. The road runs from Stephensville, Tex., to Hamilton, 43 miles.

Union Pacific.—This company has bought a half interest in the Chicago, Milwaukee & Puget Sound's new line from Black River Junction, Wash., to where it crosses the Puyallup river, three miles from Tacoma, 26 miles.

Equipment and Supplies.

CAR BUILDING

The Erie is asking prices on 30 steel underframe express cars.

The Labelle Iron Works is asking prices on 50 seventy-five-ton freight cars.

The Long Island is asking prices on 114 fifty-ton box and 20 fifty-ton gondola cars.

The Atlantic Coast Line is asking prices on two 60-ft. combination mail and express cars.

The Duluth, South Shore & Atlantic has given a contract to the American Car & Foundry Co. for repairing 400 freight cars.

The Canadian Pacific is said to have ordered 500 steel cars from the Dominion Car & Foundry Co. This item is not confirmed.

The Atchison, Topeka & Santa Fe has ordered two 55-ft., all-steel, 200-h.p. gasolene motor cars from the McKeen Motor Car Co.

The Indiana Steel Co., which recently asked prices on 20 fifty-ton slag cars, has decided to postpone indefinitely the purchase of this equipment.

The City Commissioners of Calgary, Alberta, Canada, have given a contract for eight pay-as-you-enter cars to the Ottawa Car Co. and for four of a similar type to the Preston Car & Coach Co.

The Minneapolis & St. Louis, reported in the *Railroad Age Gazette* of February 5 as being in the market for 100 freight cars, has ordered 500 thirty-ton box and 100 forty-ton gondola cars from the Mt. Vernon Car Manufacturing Co.

The Louisiana & Arkansas, reported in the *Railroad Age Gazette* of December 4 as being in the market for car equipment, has ordered two coaches and one combination mail and baggage car from the Barney & Smith Car Co.

The Seattle Electric Company has ordered 30 single-end, combination type cars with end and side doors, through the Stone & Webster Engineering Corporation. These cars will be 47 ft. 8 in. long over the buffers and will have a seating capacity of 55 passengers. The bodies are to be built by the St. Louis Car Co. and will be mounted on type C-50 double trucks made by the Standard Motor Truck Co. The cars will have General Electric No. 80 four-motor equipment and K-28 J type control. National Brake & Electric Co. air brakes will be supplied.

IRON AND STEEL.

The Bettendorf Axle Co., Davenport, Iowa, reported in the *Railroad Age Gazette* of January 22 as being in the market for 1,300 tons of structural steel for a new foundry, has ordered 1,600 tons from George W. Jackson, Inc., Chicago.

The Pittsburgh & Lake Erie, reported in the *Railroad Age Gazette* of January 22 as being in the market for 9,000 tons of rails, has given the contract for these rails, 100-lb. section, to the Carnegie Steel Company. There is no truth in the report that the price was shaded to $25 per ton.

The La Fayette Railroad, J. A. Kauffman, General Manager, La Fayette, Ga., is in the market for 375 tons of 60-lb. rails and 90 tons of 56-lb. rails, with angle bars, bolts and spikes; also a 50,000-gal. water tank complete with spout, an upright boiler and pump, and an electric light plant, complete.

General Conditions in Steel.—All reports indicate that there is to be no variation from the existing price of rails, $28 per ton. There seems to be a general feeling that the railways are holding back orders for finished steel products with the idea that this action will cause a break in rail prices, although manufacturers maintain that there will be no break. It is also supposed that the tariff movement will result in a reduction of import duties and the home market may have to consider this. If railways withhold orders for rails until after a new tariff is fixed, a foreign market will probably have very much to do with the price of rails, especially if the duty is reduced. Requests for cuts in rail prices are said to have been met with similar requests regarding freight rates and both sides maintain that the margin of profit will not permit reduction.

One consequence of the cut in prices of finished steel products has been the announcement by the Lackawanna Steel Co., of a reduction in wages, as follows: "The Lackawanna Steel Co. put into effect on March 1 a reduced scale of wages at its Buffalo works. Common labor was reduced from 14 cents per hour to 12 cents, and other rates were reduced on an average of 10 per cent., with the exception of tonnage men; the latter, owing to the small volume of operations, are already working under substantial reduction."

RAILROAD STRUCTURES.

FORT WAYNE, IND.—According to press reports officials of the Wabash are locating the site of a new freight house to be built here.

KANSAS CITY, MO.—The Chicago & Alton, Missouri Pacific and Metropolitan Street Railway have submitted plans to James L. Darnell, City Engineer, for the proposed viaduct on Lydia avenue, to cost about $77,000.

MATAMORAS, MEX.—According to press reports, contract between the National of Mexico, the Mexican Government and the St. Louis, Brownsville & Mexico Railroad for the building of an international bridge across the Rio Grande to connect the two systems of railway, has been formally signed. The plans were approved some time ago by all the interests concerned, and it is said that the material for the bridge has been ordered. The long delay in beginning work on this bridge was due to differences that arose as to its location. The present Matamoras terminus of the National of Mexico is about five miles from the proposed bridge crossing. It is estimated that the bridge will cost more than $500,000.

NEW YORK.—The first suspended girder of the new Manhattan bridge over the East river was swung into place this week. It is the intention to have the structure completed and open by December 15, 1909.

ST. LOUIS, MO.—Press reports indicate that the Missouri, Kansas & Texas has acquired terminal property to be used for storage tracks and a large freight depot.

TAYLOR, TEX.—See International & Great Northern under Railroad Construction.

WORCESTER, MASS.—The Boston & Albany has given a contract to Woodbury & Leighton, of 166 Devonshire street, Boston, to put up a new passenger station, to cost about $500,000. The architects are Watson & Huckel, of Philadelphia, Pa., and New York.

SIGNALING.

The Northern Pacific is in the market for automatic block signals for 45 miles of double-track between Tacoma and Seattle. Three-position semaphores giving indications in the upper right-hand quadrant will be used.

French Patents Bill.

The French government has introduced a bill to amend the patent law of the country to insure the adequate working of foreign patents in France. Under the present law, patents may be canceled if not worked at all in France. The principal provision of the new bill is quoted as providing that patent rights shall be held to lapse in the event of failure on the part of the holder either to exercise his right in France or in the French colonies for a period of three years after applying for his certificate, or to resume exercise of after a similar interval; or, secondly, in the event of only partial exercise of the patent in French territory. In the second event, the patent courts will be invested with discretionary power to call upon the holder of the patent to show cause why he should not exercise his rights in French territory "in an adequate degree."

Supply Trade News.

The American Car & Equipment Co., Chicago, has moved its offices from the Monadnock block to 730 Colony building.

The newly organized Duntley Manufacturing Co., Chicago, has taken the whole of the fourth floor of the Plymouth building for its general offices.

The Northwestern Railway Supply Co., 8 South Canal street, Chicago, the incorporation of which was reported in the *Railroad Age Gazette* of January 22, has increased its capital stock from $500 to $25,000.

C. B. Smyth, Assistant Mechanical Engineer of the Union Pacific, has been appointed Superintendent of the McKeen Motor Car Co., Omaha, Neb., and will hereafter devote his entire time to the interests of that company.

The Indianapolis Railway Mail Equipment Co., Indianapolis, Ind., has been incorporated to manufacture and sell railway mail equipment. Capital stock, $100,000. The incorporators are William A. Zumpfe, Ernest L. Killen and George B. Mabin.

Charles W. Waughop, Jr., has been appointed Sales Agent of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., with headquarters at St. Louis. Mr. Waughop will act as the coupler expert of the company in introducing the Excel coupler.

T. Harbert Taylor, 419 Empire building, Atlanta, Ga., has about completed the organization of a railway and mill supply company, to be located in Atlanta, and would like to hear from concerns manufacturing articles handled by railway and mill supply houses.

The H. W. Johns-Manville Co., New York, will rebuild its warehouse and factory recently destroyed by fire at Milwaukee, Wis. H. J. Esser, Architect, Milwaukee, is designing a six-story fireproof structure, to be 50 ft. x 150 ft., and a separate office building.

M. N. Demiejian, 43 White street, New York, wants catalogues of machine tools and miscellaneous railway supplies. He has been in the United States for some months and expects to return to Turkey in a few weeks, where he will act as sales agent for locomotives and other railway equipment and materials.

E. E. Hudson, formerly Manager of Sales of the Battery Supplies Co., Newark, N. J., has been made Manager of Sales of the Primary Battery Department of the Edison Manufacturing Co., Orange, N. J. The Edison company's sales office at 10 Fifth avenue, New York, has been discontinued, and hereafter all communications should be addressed to the main office at Orange.

The Crocker-Wheeler Company, Ampere, N. J., recently booked orders for two 400-k.w., 575-volt, engine-driven railway generators for the city of Edmonton, Canada. An order for eight form W rolling mill motors aggregating 170 h.p. has been placed by the Alliance Machine Co., Alliance, Ohio. A 125-h.p., 230-volt motor to operate a friction saw has just been ordered by Pettibone, Mulliken & Co., Chicago.

The following telegram has been received from the McKeen Motor Car Co., Omaha, Neb.: "An equipment company in Middle West discovered endeavoring to sell two steam motor cars by representing them to be McKeen cars, which is misrepresentation of facts. We do not want our cars misrepresented to the public and will be pleased if you will make mention of this matter in your news columns."

Joel S. Coffin, Vice-President of the American Brake Shoe & Foundry Co., Mahwah, N. J., received, on Saturday last, a tribute from his friends and former associates in the Galena-Signal Oil Co., Franklin, Pa. Galena men from all parts of the country assembled in Mr. Coffin's office, presenting him with a loving cup engraved with their facsimile signatures, also a mahogany office desk and a handsome specially designed ink stand.

Fred A. Poor, who has been in Europe for the past 20 months in charge of the foreign business of the Rail Joint Co., New York, has been placed in charge of the Chicago office of that company, commencing March 1. Prior to going to Europe, Mr. Poor was for several years Western Representative of the Weber Railway Joint Manufacturing Co., a subsidiary company, and before that time was in the engineering department of the Illinois Central.

The February issue of the *T. P. A. Bulletin*, published by the Technical Publicity Association, New York, gives, as usual, an account of the previous monthly meeting, quoting from remarks on advertising by several of those present. The bulletin also announces that a committee has been appointed to make a uniform style of advertising rate card, to be recommended for the use of trade papers. A list is published, showing the technical and trade journals which have submitted to the association reports on their circulation.

E. H. Symington, of the T. H. Symington Co., Baltimore, Md., who last fall completed a second trip around the world for his health, had another break-down in Europe resulting from the serious skull fracture he sustained in Chicago nearly two years ago. John F. Symington, manager of Eastern Sales, who is traveling in Europe on his wedding trip, reports from Berlin that his brother is soon to leave a hospital there in which he has undergone treatment for several months. It may be several more months before Mr. Symington can return to his work in the Railway Exchange building, Chicago.

R. B. Clark, Jr., who has been for the past year in the Chicago office of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., in the capacity of Sales Agent, has been transferred to the New York office in a like capacity, where he will be associated with F. C. Norton at No. 1 Wall street. H. H. Waldron, for a number of years Secretary to W. H. Newman when he was President of the New York Central Lines, and later Secretary to W. J. Wilgus, at that time Vice-President of the New York Central Lines, succeeds Mr. Clark, and will co-operate with F. W. Graves in the Chicago office in the Fisher building.

The Nilson, Miller Co., Hoboken, N. J., has been incorporated with $25,000 capital. The plant is at 1300 Hudson street, in the shop formerly occupied by W. D. Forbes & Co. The company will conduct an engineering and general machine shop business, making a specialty of designing and building, to order, electrical apparatus, gasolene engines, etc., for commercial vehicle, marine and stationary use; also experimental work and special machinery. L. G. Nilson, Chief Engineer of the Strang Gas-Electric Car Co., New York, is President of the new company; he will continue as Consulting Engineer for the Strang company. J. E. Miller is Secretary and Treasurer.

The Ralston Car Works, Ralston, Neb., the incorporation of which was reported in the *Railroad Age Gazette* of February 26, has secured 30 acres of land at Ralston, about six miles from Omaha, and will begin about April 1 the erection of buildings, laying of tracks, etc., for a freight car repairing plant with a capacity of at least 400 cars a month. The plant will be equipped with machinery to make heavy repairs on both wood and steel cars. The general offices of the company will probably be at Omaha until such time as the plant at Ralston is completed. The incorporators are: M. S. Dean, W. J. Lacey, James E. Simons, Harley Parker and C. A. Ralston, all of Chicago; George T. Ross, St. Louis, Mo.; William Hassman, Peoria, Ill., and L. Howard and H. H. Baldrege, of Omaha. The officers of the company have not yet been elected.

William O. Duntley, Vice-President of the Chicago Pneumatic Tool Co., Chicago, has been elected President, succeeding his brother, J. W. Duntley, resigned to become President of the Duntley Manufacturing Co., Chicago. Charles Booth has been elected Vice-President, succeeding Mr. Duntley, and W. A. Mitchell has been elected Assistant Secretary. John R. McGinley, of Pittsburgh, Pa., succeeds Charles M. Schwab as Chairman of the Board. William O. Duntley, whose photograph is reproduced herewith, was born July 21, 1867, at Wyandotte, Mich. In 1884 he began his business career with an electrical company at Detroit, Mich. He went to Chicago in 1887 and has since been identified with different establishments in that city. For a number of years he was engaged in electrical work for Baggot & Co., and in 1895 was appointed Traveling Salesman for the Chicago Pneumatic Tool Co. In 1899 he was elected Vice-President, General Manager and a Director of the tool company. The new officials were elected at a meeting held on February 15.

W. O. Duntley.

TRADE PUBLICATIONS.

Pay-as-you-enter Cars.—The J. G. Brill Co., Philadelphia, Pa., is mailing a 9-in. x 16-in. engraving of a new type pay-as-you-enter car, mounted on Brill No. 27-F2 trucks, 300 of which cars were recently built for the Chicago City Railway Company.

Freight Shipment.—Oelrichs & Co., general agents of the North German Lloyd Steamship Co., 5 Broadway, New York, send a 72-page book entitled "Aid to Shippers," which contains a quantity of information of value to those engaged in the export or import trade. The book includes a table of foreign moneys with United States equivalents; foreign weights, measures, tariffs, custom requirements, etc.

Air Compressors.—Catalogue EE-36, issued by the Ingersoll-

Rand Co., New York, illustrates and describes small power driven air and gas compressors of four types; Class EE-1; Imperial Type XI; Imperial Junior and Imperial Baby. This catalogue is profusely illustrated, printed on heavy paper and contains general information and data which is instructive and valuable to those interested in or operating compressors.

Chloride Accumulators.—The Electric Storage Battery Co., Philadelphia, Pa., has just issued Bulletin No. 112, which contains an interesting and instructive article entitled "The Chloride Accumulator in Iron and Steel Mills." Bulletin No. 110 describes the operation of chloride accumulators in connection with remote control oil switches. These bulletins are 8 in. x 10½ in., printed on heavy paper and design for filing in a loose leaf cover.

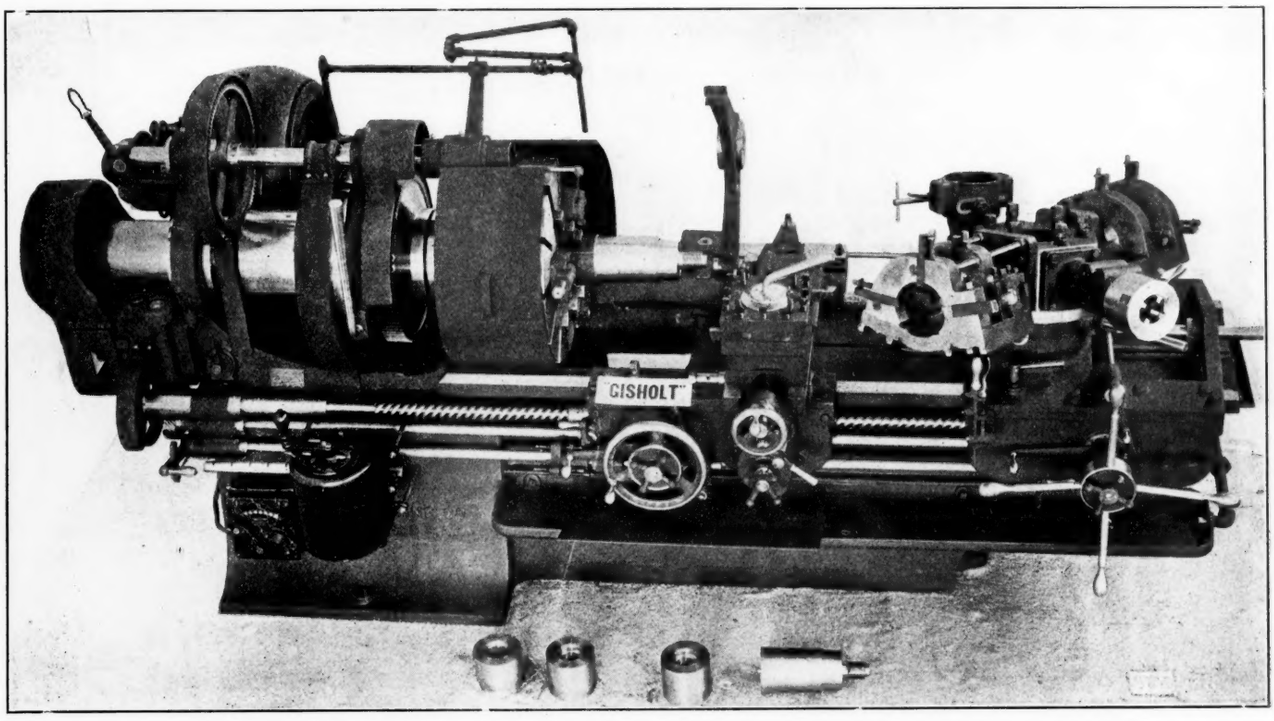


Fig. 1—Gisholt 24-in. Lathe with 6¼ in. Hole.

Gisholt Turret Lathes for Bar and Chuck Work.

The capacity of the turret lathe has been greatly enlarged in recent years, not only as measured by the amount of metal removed, but in the size of the pieces which it can handle. The Gisholt lathes, here illustrated, are particularly adapted to heavy locomotive work. Fig. 1 shows a 24-in. lathe with 6¼-in. hole in the spindle. This tool is in use at the Chicago shops of the Chicago & North Western. The Rock Island has at its Moline shops a lathe with the same size spindle, but 28-in. swing. The majority of these big bore lathes swing 24 in. and have either a 6¼-in. or a 5-in. hole through the spindle. The illustration shows a large crosshead pin as finished from the solid steel bar. A pin, 11½ in. long, 5½ in. in diameter at the large end and 5 in. rod bearing, has been finished in 45 minutes. This lathe can be used also for finishing the ends of piston rods and other similar large bar work. The drawings in Fig. 2 show some of the various locomotive pins which are finished in this lathe.

By the use of the big bore lathes on circular bars, the cost of forging is eliminated, the pieces do not have to be centered, considerable handling of stock is done away with, and calipering is reduced to a minimum. In finishing a large crosshead pin, the steel bar is held in a three-jawed scroll chuck, and three chuck blocks with set screws. The first tool post is used for truing up the end of the bar, and next the roughing box tool on the main turret. The rod bearing and the body for the thread are then finished to exact size by cutters on turret, and the two taper fits into crosshead are finished by another pair of turret cutters. The die head is then used for the thread and the pin is cut off by a cutter in the tool post. The pins may be finished complete or, if desired, the taper portions may be left with sufficient stock so that when wanted for repair purposes they may be finished to the exact size then required. The pins are often made up in this way for store stock.

Fig. 3 shows a 34-in. Gisholt lathe in the Altoona shops of the Pennsylvania Railroad; the tool equipment specially adapted for the finishing of the pieces is shown at the left in the foreground of the engraving. The cost of finishing these pieces on the Gisholt lathe was materially reduced as compared with the work on an ordinary lathe. The finished details here shown include piston centers and bull rings, double eccentrics and crosshead centers.

Fig. 4 illustrates some of the locomotive details which are finished by chuck work on this machine. Concave piston centers are finished in two operations. First, the concave surface is roughed off by cutter

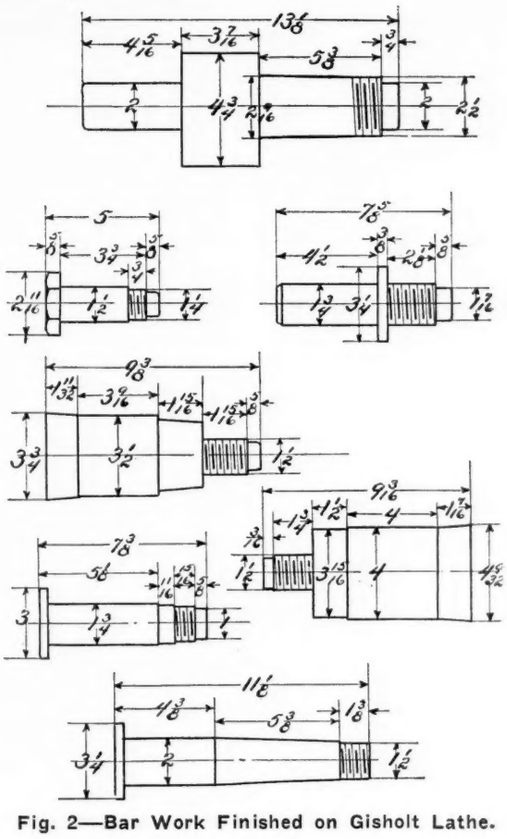


Fig. 2—Bar Work Finished on Gisholt Lathe.

in tool post; the hole is bored rough by one tool and finished by a taper reamer on the turret head. In the second operation, the convex portion of the center is outside in the chuck, but before chucking a taper bushing with a cylindrical hole is inserted so that a spindle can enter it and steady the outside cutters. The outside surface is then roughed by cutter in tool post as before and the exact finish obtained by cutters on the turret. Mechanical officers and foremen have been quick to grasp the advantages of these machines, and they are now found in nearly all the progressive locomotive shops of the country.

The Gisholt Machine Company, Madison, Wis., manufactures also motor-driven horizontal drilling and boring machines, vertical boring mills and universal tool grinders.

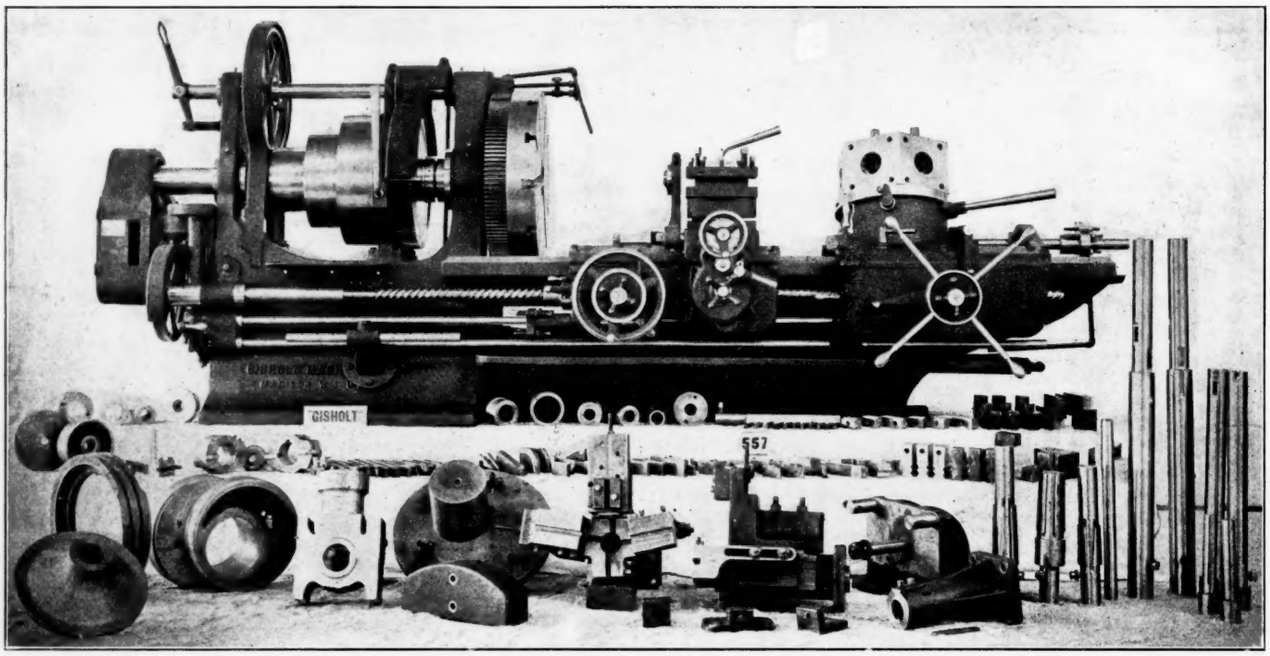


Fig. 3—Gisholt 34-in. Turret Lathe.

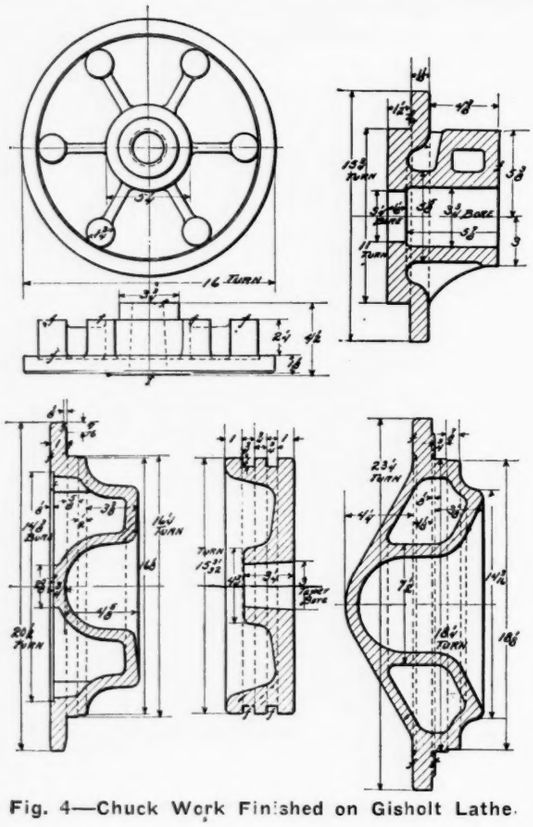
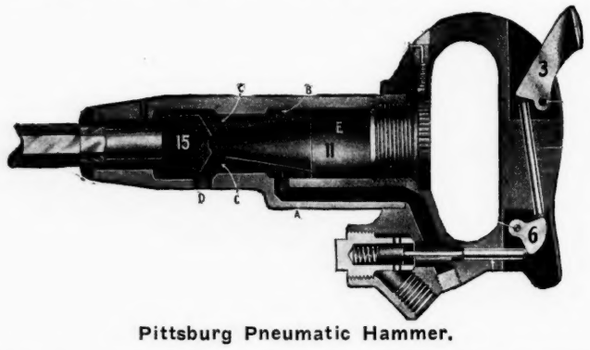


Fig. 4—Chuck Work Finished on Gisholt Lathe.

Pittsburg Pneumatic Hammers.

The accompanying illustration shows a hammer for chipping, flue beading, calking, etc. This hammer is of the valveless type, with but one moving part which performs the dual function of valve and striking piston. The hammer is designed to be durable and reliable, having substantial dimensions of parts and ample area of direct air passages. As shown in the illustration, the construction is simple and the cycle of operations may be easily followed. Compressed air enters through the port A and maintains a constant pressure against shoulder B on the piston, forcing it backwards until ports C come into communication with the feed port A, when pressure enters the cylinder E through the hollow portion of the piston. Acting against the full area of the piston it overcomes the constant pressure on the small shoulder B and drives the piston forward to strike the blow. The piston ports C, coming into communication with the exhaust chamber D in the cylinder, permit the pressure back of the piston to escape to the atmosphere, when the constant pressure on the piston shoulder again moves the piston backward as before. The blows are thus repeated in rapid succession. The piston is returned against an air cushion formed by the pressure admitted through the hollow portion of the piston and vibration is said to be reduced to a minimum.

It will be noted from the position of the air ports and passages that the hammer takes air behind the piston only during the first quarter of its forward stroke, thus using the air expansively and economically. Similarly to an automatic cut-off engine, it requires ample volume of pressure during the short period of intermittent admission. To insure this requisite volume, larger hose connections are provided than are required for hammers taking air during the entire forward and backward strokes. This hammer can be taken apart and reassembled in a very short time, and no particular skill is required to maintain it in working order.



Pittsburg Pneumatic Hammer.

These hammers are made by the Pittsburg Pneumatic Co., Canton, Ohio.